



IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

SIR A. SMITH WOODWARD, LL.D., F.R.S., F.G.S.,

SIR GUY A. K. MARSHALL, C.M.G., D.Sc., F.R.S.,

C. TATE REGAN, M.A., D.Sc., F.R.S.,

AND

W. T. CALMAN, C.B., D.Sc., F.R.S.

VOL. XIX.—TENTH SERIES.

LONDON :

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS, LTD.

1937.

"Omnes res create sunt divinæ sapientiæ et potentiæ testes, divitiis felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportionè, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstinata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—*LINNÆUS*.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—*BRÜCKNER, Théorie du Système Animal, Leyden, 1767.*

. The sylvan powers
 Obey our summons; from their deepest dells
 The Dryads come, and throw their garlands
 And odorous branches at our feet; the Nymphs
 That press with nimble step the mountain-thyme
 And purple heath-flower come not empty-handed,
 But scatter round ten thousand forms minute
 Of velvet moss or lichen, torn from rock
 Or rifted oak or osvern deep: the Naiads too
 Quit their loved native stream, from whose smooth face
 They crop the lily, and each sedge and rush
 That drinks the rippling tide: the frozen poles,
 Where peril waits the bold adventurer's tread,
 The burning sands of Borneo and Cayenne,
 All, all to us unlock their secret stores
 And pay their cheerful tribute.

J. TAYLOR, Norwich, 1818.



CONTENTS OF VOL. XIX.

[TENTH SERIES.]

NUMBER 109.

	Page
I. The Structure and Development of the Pointed Tail of the Ocean Sunfish, <i>Masturus lanceolatus</i> . By E. W. GUDGER, Associate Curator of Fishes, American Museum of Natural History. (Plates I. & II.)	1
II. On <i>Leptolepis bronni</i> Agassiz. By DOROTHY H. RAYNER, University College, London.....	46
III. A List of the Denny Collection of Mallophaga in the British Museum (Natural History) and of their Hosts. By GORDON B. THOMSON, Department of Entomology, British Museum of Natural History	74 •
IV. A Note on a Collection of Polychæta from the Eastern Mediterranean, with the Description of a new Species. By C. C. A. MONRO, Assistant Keeper in the Department of Zoology, British Museum	82
V. A new Species of <i>Omphyma</i> and some Remarks on the <i>Pyenactis-Phaulactis</i> Group of Silurian Corals. By A. J. BUTLER, M.Sc. (Plates III. & IV.)	87
VI. New Genera and Species of Thysanoptera from South Africa. By J. DOUGLAS HOOD, Ph.D., University of Rochester, U.S.A.	97
VII. On the Freshwater <i>Idoteids</i> of New Zealand (Crustacea, Isopoda). By G. E. NICHOLLS, D.Sc., Professor of Biology, University of West Australia	113
VIII. Descriptions and Records of Bees.—CLIX. By T. D. A. COCKRELL, University of Colorado	136
IX. Description of Female of <i>Automolis pulcherrima</i> and a new Species of <i>Automolis</i> . By Lord ROTHSCHILD	144
X. Notes on Fossorial Hymenoptera.—XLVI. On new Australian <i>Thynnids</i> . By ROWLAND E. TURNER.....	144

	Page
XI. Some new Asiatic Bees of the Subfamily <i>Anthidiinae</i> (Apoidae). By G. A. MAVROMOUSTAKIS, Limassol, Cyprus	151
XII. On the Type-locality of <i>Ellobius talpinus</i> Pallas. By J. L. CHAWORTH-MUSTERS. From the Department of Zoology, British Museum (Natural History)	158
XIII. On the Nomenclature of the Palearctic Chipmunk. By J. L. CHAWORTH-MUSTERS. From the Department of Zoology, British Museum (Natural History)	158
<i>New Books</i> :—British Grasshoppers and their Allies; a Stimulus to their Study. By MALCOLM BURR	160
The Birds of Tropical West Africa. By D. A. BANNERMAN. Vol. IV.	ib.

NUMBER 110.

XIV. Studies of Mexican Fossil Foraminifera. By R. WRIGHT BARKER, M.A., F.G.S., and THOMAS F. GRIMSDALE, B.Sc. (Plates V.—IX.)	161
✓ XV. Studien über südostasiatische Calandrinien (Col., <i>Curcul.</i>). Von KLAUS GUNTHER, Dresden. (Tafel X.)	178
✓ XVI. <i>Magdalinae</i> (Coleoptera, <i>Curculionidae</i>) de l'Amérique méridionale. Par A. HUSTACHE	198
✓ XVII. New <i>Curculionidae</i> (Col.) from Mauritius. By Sir GUY A. K. MARSHALL	248
XVIII. The Canadian Ammonite Genus <i>Gastrophiles</i> in the English Gault. By L. F. SPATH	257
XIX. Notes on Mallophaga.—V. By GORDON B. THOMPSON (Department of Entomology, British Museum of Natural History). ..	261
XX. A pelagic Nudibranch of the Family <i>Phyllirhoidae</i> from the Waters of New South Wales: a Note on the Subgenera <i>Otilopsis</i> and <i>Cephalopyge</i> . By WILLIAM J. DAKIN, D.Sc., F.Z.S., and ALAN COLEFAX, B.Sc.	266
XXI. Entomological Expedition to Abyssinia, 1926-7: Coleoptera, <i>Carabidae</i> and <i>Cicindelidae</i> . By CHARLES ALLUAUD, Les Ouches-à-Croissant, Creuse, France. With Introductory Note and Appendix on <i>Cicindelidae</i> by HUGH SCOTT, Sc.D., Department of Entomology, British Museum (Natural History) ...	272
XXII. New African <i>Lavinae</i> (Coleoptera, <i>Dryopidae</i>). By H. E. HINTON (Zoological Laboratory, Cambridge)	289
XXIII. Note on the Identity of the Cape "White-fish," <i>Barbus capensis</i> . By K. H. BARNARD, South African Museum	304
XXIV. Iguana Remains from Barbados. By W. E. SWINTON, Ph.D., F.R.S.E., Department of Geology, British Museum (Natural History)	306

CONTENTS.

v

	Page
XXV. A new African <i>Hypochrysa</i> (Neuroptera). By D. E. KIMMINS, Department of Entomology, British Museum (Natural History)	307
XXVI. Moroccan Species of the Genus <i>Stenobothrus</i> (Orthoptera, <i>Acrididae</i>). By B. P. UVAROV, D.Sc., British Museum (Natural History)	308
XXVII. <i>Monolene danae</i> , a new Flatfish from Panama, caught bathypelagically. By ANTON FR. BRUUN, M.Sc., Ph.D., Charlottenlund Slot, Copenhagen. (Papers from the 'Dana' Oceanographical Collections.—No. 15.)	311

NUMBER 111.

XXVIII. Records and Descriptions of North American Bees. By CHARLES D. MICHENER, Pasadena, California	313
XXIX. New or little-known <i>Tipulidæ</i> (Diptera).—LII. Australasian Species. By CHARLES P. ALEXANDER, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.	329
XXX. Note on the Excretory System of the Trematode Genus <i>Maritrema</i> Nicoll, 1907, and the Systematic Position of the <i>Microphallinæ</i> Ward, 1901. By MIRIAM ROTHSCHILD	355
XXXI. Note on a Collection of Polychæta from South Africa, with the Description of a new Species belonging to the Family <i>Sabellidæ</i> . By C. C. A. MONRO, Department of Zoology, British Museum (Natural History)	366
XXXII. A brief Survey of the Species of Mallophaga described from (1) Anseriformes and Ciconiiformes (<i>Phenicopteri</i>). By GORDON B. THOMPSON, Department of Entomology, British Museum (Natural History)	370.
XXXIII. A new Genus belonging to the Subfamily <i>Platygasterinæ</i> (Hym., Proctotrupoidea). By G. E. J. NIXON, B.A., Department of Entomology, British Museum of Natural History ..	372
XXXIV. Mantodes from the Lake Rudolf Rift Valley Expedition, 1934. By M. BEER, Vienna	376
XXXV. A brief Survey of the Species of Mallophaga described from (2) Falconiformes. By GORDON B. THOMPSON, Department of Entomology, British Museum (Natural History)	379.
XXXVI. Fossil Cichlid Fishes of Dr. L. S. B. Leakey's Expedition to Kenya in 1934-5. By ETHELWYNN TREWAVAS, D.Sc., Assistant Keeper in the British Museum of Natural History.	381
XXXVII. Two new African Species of <i>Telenomus</i> (Hym., Proctotrupoidea). By G. E. J. NIXON, B.A., Department of Entomology, British Museum (Natural History)	387

NUMBER 112.

- XXXVIII. Records and Descriptions of North American Bees.
By CHARLES D. MICHENER, Pasadena, California 393

XXXIX. Entomological Expedition to Abyssinia, 1926-7:
Coleoptera, *Carabidæ*; the Genera *Bembidion* and *Tachys*.
By Dr. FRITZ NETOLITZKY, University of Czernowitz (Cernăuți),
Rumania. Edited and with Introductory Note by HUGH SCOTT,
Sc.D., Department of Entomology, British Museum (Natural
History) 410

XL. *Pseudocandona elongata*, a new Species of Ostracod.
By P. F. HOLMES. (From the Zoological Laboratory, Cambridge.) 412

XLI. Some new Ephemeroptera. By D. E. KIMMINS, Depart-
ment of Entomology, British Museum (Natural History).
(Plate XI.)..... 430

XLII. New Species and Records of *Mutillidæ* (Hymenoptera)
from Borneo and the Solomon Islands. By CLARENCE E. MICKEL,
University of Minnesota 441

XLIII. Le prétendu genre *Pseudaplodon* de Gerrit S. Miller
(*Aplodontia asiatica* Schlosser) du Pontien de Mongolie. Par le
Docteur MADELEINE FRIANT 456

XLIV. The Echinoid Name *Diadema*. By TH. MORTENSEN.... 463

XLV. A new Species of *Plesiothrips* (Thysanoptera—*Thripidæ*)
from Argentina. By G. D. MORISON, North of Scotland College
of Agriculture, Aberdeen, Scotland 469

NUMBER 113.

XLVI. On the Biology and Ecology of *Hemiodæsus veitchi*
Hacker (Hemiptera, *Peloridiidæ*). By I. W. HELMSING and
W. E. CHINA. (Plates XII.—XVI.)..... 473

XLVII. Papers on Oriental *Carabidæ*.—XXXI. By H. F.
ANDREWES 489

XLVIII. Descriptions and Records of Bees.—CLX. By T. D. A.
COCKERELL, University of Colorado 495

XLIX. Some Remarks on the Structure, Habits, and Dis-
tribution of the Benthonic Sergestid *Steynonella* Borradaile (Crus-
tacea, Decapoda). By MARTIN D. BURKENROAD, Bingham
Oceanographic Laboratory, Yale University 505

L. Preliminary Note on Four new Rodents from Korab
Mountains. By V. and E. MARTINO 514

LI. Tropical Species of *Tropidopola* St. and the Past History
of the Genus (Orthoptera, *Acrididæ*). By B. P. UVAROV, D.Sc.,
British Museum (Natural History) 518

LII. *Tylidæ* (*Micropezidæ*, Diptera) aus der Sammlung des
British Museum of Natural History. Nachträge zur "Revision
der Tyliden.—II." Von WILLI HENNIG, Leipzig 521

CONTENTS.

vii

	Page
LIII. Mammals collected by the Lake Rudolf Rift Valley Expedition, 1934. By JANE ST. LEGER, F.Z.S. From the Department of Zoology, British Museum of Natural History.....	524
LIV. On Two new Polychaetes from the Indian Ocean. By C. C. A. MONRO, Department of Zoology, British Museum (Natural History)	531
LV. Entomological Expedition to Abyssinia, 1926-7: Coleoptera, <i>Carabidae</i> , <i>Agonini</i> . By L. BURGEON, Musée du Congo Belge Tervueren, Belgium	539
LVI. Descriptions and Records of Bees.—CLXI. By T. D. A. COCKERELL, University of Colorado.....	544

NUMBER 114.

LVII. On a remarkable Fish from the Lower Permian of Autun, France. By T. S. WESTOLL, B.Sc., Ph.D., Department of Zoology and Comparative Anatomy, University College, London	553
LVIII. Entomological Expedition to Abyssinia, 1926-7: Coleoptera, <i>Brethidae</i> and <i>Lycidae</i> . With Supplement on a new Lycid from the Cameroons. By R. KLEINE (Stettin)	578
LIX. Some Parasitic Worms from East African Chamaeleons. By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History). (Plate XVII.)	584
LX. On a Collection of Diptera from East Greenland. By J. E. COLLIN, F.E.S.	594
LXI. Results of the Oxford University Expedition to Sarawak (Borneo), 1932.—Gyriniden (Coleoptera). Von GEORG OCHS, Frankfurt a. Main. (Plate XVIII.)	596
LXII. On the Coral Genus <i>Fungites</i> . By W. D. LANG, Sc.D., F.R.S., and STANLEY SMITH, D.Sc., F.G.S.	617
LXIII. Some new Forms of <i>Formicidae</i> and a Correction. By HORACE DONISTHORPE, F.Z.S., F.R.E.S., etc., Department of Entomology, British Museum (Natural History)	619

CORRIGENDA.

- A new Species of *Omphyma* and some Remarks on the *Pycnactis-Phaulactis* Group of Silurian Corals, by A. J. BUTLER, M.Sc. (Ann. & Mag. Nat. Hist. ser. 10, vol. xix., Jan. 1937).
- P. 88, line 21, for *Linnaeus* read (Linnaeus).
- P. 91, line 24, and p. 92, lines 2 and 4, for *obturata* read *duplex*.
- P. 92, line 9, for *shale* read *Shale*.
- P. 96, line 5, for *Shales* read *Shale*.
- P. 96, line 12, for *fig. 1 c* read *fig. 1 d*.

PLATES IN VOL. XIX.

PLATE	I.	} Species of Masturus.
	II.	
	III.	} Omphyma and Phaulactis.
	IV.	
	V.	} Pseudolepidina, Miogypsina, Rotalia, and Borelis.
	VI.	
	VII.	
	VIII.	
	IX.	} Südostasiatische Calandrinien.
	X.	
	XI.	New Ephemeroptera.
	XII.	} Hemiodæcus veitchi Hacker.
	XIII.	
	XIV.	
	XV.	
	XVI.	} Parasitic worms from East African chameleons.
	XVII.	
	XVIII.	Cedeagus von Orectochilus seminitens, sp. n.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

"..... perlitora spargite muscum,
 Naiades, et circum vitreos considite fontes:
 Pollice virgineo teneros hic carpite flores:
 Floribus et pictum, divæ, replete canistrum.
 At vos, o Nymphæ Craterides, ite sub undas
 Ite, recurvato variata corallia trunco
 Vellite muscosis e rupibus, et mihi conchas
 Fertæ, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettusi, Eol. 1.

No. 109. JANUARY 1937.

I.—*The Structure and Development of the Pointed
 Tail of the Ocean Sunfish, Masturus lanceolatus.* By
 E. W. GUDGER, Associate Curator of Fishes, American
 Museum of Natural History.

[Plates I. & II.]

CONTENTS.

	Page
Introduction	2
Figure of an adult <i>Masturus</i>	2
Structure and Development of the Tail in a Series of Larval and Post-larval Specimens	3
The Primitive Tail of the Late Larva	3
The disappearing Primitive Tail of the Early Post- larvæ	5
The square-cut Tail of the Intermediate Post-larvæ ...	10
The developing Secondary Tail of the Late Post-larvæ.	15
External Structure of the Secondary Tail	15
Internal Structure of the Late Post-larval Tail	27
Structure of Tail unknown from Late Post-larvæ to young Adults	36
Internal Structure of Tail in adult <i>Masturus</i>	36
The earliest Evidence	37
Recent Evidence from Florida Specimens	39
Does <i>Masturus</i> use its Tail as a Locomotor Organ ?	43
What is the Position of <i>Masturus</i> in the Family Molidae ?	44

INTRODUCTION.

In the course of an extensive study of the natural history and geographical distribution of the pointed-tailed ocean sunfish, it has been found advisable to include the distribution of the young forms. Study of their distribution has given much insight into the problem of the dispersal of the adults. Furthermore, the study of both young and old fish has focussed attention especially on the morphology of the curious tail-fin—the distinctive organ of *Masturus lanceolatus*. Investigation of the structure and development of the tail in the young will throw much light on the anatomy of this organ in the adult, and will, I trust, help give some idea of the position of *Masturus* in the family Molidae, and of the affiliations of the family. These are the objectives of this article.

In the ocean sunfishes, and especially in *Masturus* in both the early and late stages, it is extremely difficult to determine the limits between dorsal and caudal and anal fins. For each specimen of *Masturus* studied an effort will be made to do this. But in addition to giving the ray-count for each fin as accurately as possible, count of the rays in the Dorsal + Caudal + Anal complex will be made, and particularly the number of the rays in the caudal lobe will be noted. These counts are of diagnostic value in determining whether the specimen is a *Masturus*.

Grateful acknowledgment will be made in the text to follow for the loan of material and for help received, both of which have materially forwarded this study.

FIGURE OF AN ADULT *MASTURUS*.

In order that the reader may have an idea of the appearance and external characters of the adult *Masturus lanceolatus*, the pointed-tailed ocean sunfish, there is given as fig. 1 (Pl. I.) a reproduction of the photograph of the specimen in which the structure of the lobe was first investigated. This account will be given later (p. 36) in the section dealing with the internal structure of the caudal lobe in the adult *Masturus*.

Attention is called to the somewhat elongate form of the fish (Pl. I. fig. 1), to the close approximation of the unpaired fins (the dorsal, caudal, and anal) making an

almost non-separable fin complex, and particularly to the peculiar thumb-like lobe just above the centre of the caudal region. This projection, which varies greatly in form and which in this fish has plainly suffered mutilation, gives point to the redundant name of the fish: *Masturus* (Gr. *mastos*, breast or nipple; Gr. *oura*, tail) *L. lanceolatus*—the nipple-tailed, pointed-tailed fish.

STRUCTURE AND DEVELOPMENT OF THE TAIL IN A SERIES OF LARVAL AND POST-LARVAL SPECIMENS.

By bringing together a series of figures of such specimens of *Masturus*, it will be possible to trace the development of the caudal fin from a larva 2.8 mm. long up to the largest post-larval fish (about 60 mm. long) ever described.

The Primitive Tail of the Late Larva.

In this study the statement has twice been found that the young of the common ocean sunfish (*Mola mola*) has a primitive tail, that this disappears and is replaced by a secondary and permanent one. However, authors making these statements described post-larval young sunfish thought to be young *Molas*. These all had tails with a central filament, which was believed to be lost when the young sunfish developed into adult *Molas*. They were the young of *Masturus* which had undergone metamorphosis, had lost their larval tails, and had developed tail structures which I shall be able to show are the fundamentals of the adult tail of *Masturus*. Fortunately there is a figure at hand which shows the primitive fin-fold tail, a structure which none of the authors quoted ever saw. This, which will now be figured and described, was first seen and designated by Johannes Schmidt (1921 (1, 2)). As will be noted in the course of this article, my debt to this distinguished ichthyologist is a heavy one, and grateful acknowledgment is made here and now.

A 2.8 mm. larva.—The 'Dana' expedition collected in 1920 in or near the centre of the Sargasso Sea, the smallest larval *Masturus* found on record in this study. Schmidt first figured this from a photograph in 1921 (1921 (1, 2)). As may be seen in fig. 2, in addition to

a remarkable series of serrate wedge-shaped or pyramidal spines, this little fish has a full complement of the fins found on any adult molid fish: pectoral (with about 10 rays), dorsal (9 rays), anal (c. 8) and—most remarkable—a finely developed fan-shaped caudal fin (without rays) at the end of a short but distinct tail. This tail and caudal fin are, moreover, decidedly below the median line of the body. The anal, it must be noted, even in this early stage points approximately in the direction normal in the adult.

This figure, as reproduced in Schmidt's book ('Dana's Tøgt,' 1932), shows distinct rays not only in dorsal (8) and anal (8), but in the embryonic caudal (8) as well. Dr. A. Vedel Tåning, Schmidt's successor in the Marinbiologisk Laboratorium at Copenhagen, has very kindly sent me a print (Pl. I. fig. 2 herein) from the original photographic negative. This, like Schmidt's 1921 figure, shows faint fin-rays in dorsal and anal, but *none* in the caudal. Study of printed figures and the photograph makes it clear that the figure in 'Dana's Tøgt' (Schmidt, 1932) has been heavily retouched.

The final clearing up of this matter came in a letter from Dr. Tåning, who has taken the pains to examine this little fish and compare it with the photograph (fig. 2). He sent me a large sketch which shows a pointed stump surrounded by a fan-shaped fin-fold, and wrote that "the stump is a part of the primitive caudal end (notochorda). As in all larval fishes the embryonal fin-fold of the tail has no rays, but is cellular in structure with some faint striations."

Here then in this 2.8 mm. *Masturus* is found a well-developed primitive fan-like caudal fin, an extraordinary structure for a molid fish, which is evidently used as an organ of locomotion. It is unfortunate that other larvæ of *Masturus* have not been figured and described. But there is evidence that this extraordinary primitive fin is a family character. Schmidt (1932, fig. 197—nos. 6, 7, 8) figures larval *Ranzanias* 1.7, 1.8, and 2.4 mm. long, each with a similar fan-shaped tail-fin devoid of rays built around a similar pointed fleshy base. Furthermore, I have had the pleasure of examining Dr. William Beebe's collection of little ocean sunfishes from Bermuda. These range in size up to about 2.5 or 3 mm., and are provided

with the characteristic caudal fin just referred to and figured in my no. 2. Whether these are the young of *Masturus* or of *Ranzania* or *Mola*, I cannot say. I do not know of any figures of definitely determined Molas of this very early stage. But I venture to predict that the larvæ of *Mola*, like those of *Masturus* and *Ranzania*, have such primitive fan-shaped caudals—i. e., that this fan-shaped caudal is a characteristic larval organ of the Molidae, which, as we shall see, is lost in metamorphosis.

Before leaving this smallest recorded *Masturus* (fig. 2) attention must be called to the shortening of the tail itself (apart from the tail-fin) when contrasted with little Ranzanias, measuring 1.7, 1.8, and 2.4 mm. long, shown in Schmidt's figures (1921 (1); 1932) and found in specimens of sunfish in Beebe's collections. Already has metamorphosis begun in this little *Masturus* as Schmidt found it in his microscopic Ranzanias. Furthermore, the dorsal and anal fins seem to arise from the beginnings of definite bases.

The disappearing Primitive Tail of the Early Post-larvæ.

For a long time I followed a false lead in trying to understand the external caudal structure in the early post-larvæ of *Masturus*, but finally what is believed to be the true explanation came to me—and this will now be made clear to the reader.

In studying the central caudal structure in the young post-larval forms of *Masturus*, it has been found that on the basis of tail-structure the young fish are divisible into three groups—as set out in the table of contents. This tail-structure will now be considered in the earliest post-larval stages in which it undergoes changes that result in the final disappearance of the primitive caudal stump.

A 5 mm. post-larva.—In the collections of the 'Dana,' made in 1920 in the west central part of the Sargasso Sea, is another very small sunfish. This is only slightly less than twice the size of the specimen just figured and described. Schmidt (1921 (1, 2); 1932) portrays this also from a photograph. Already in this very small specimen (fig. 3 herein) the pyramidal serrate spines have disappeared, and a number of them have been replaced by

long slender "thorns" striate at their bases. The pectoral (c. 10 rays), dorsal (c. 8), and anal (c. 9) fins have persisted and have definite bases, and the dorsal and anal are tilted into their approximate normal positions. Whether these are the fins of the previous stage (fig. 2) further developed or whether they are newly formed organs cannot be definitely stated; but judging by position, general form, and fin-ray count, I incline to the former idea. Unfortunately, Pl. I. fig. 3 shows the fishlet in quartering rather than lateral aspect, and the caudal lobe is thus very much foreshortened.

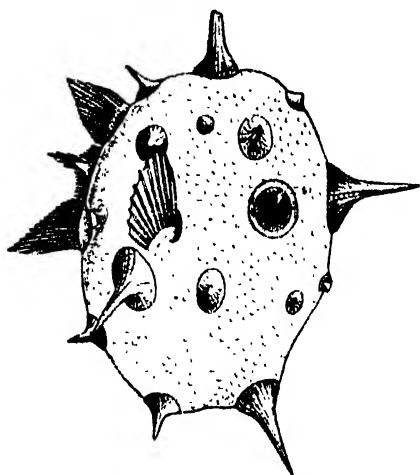
Most extraordinary is the change which has taken place in the caudal fin. The fan-shaped fin itself is gone, and the tail is reduced to a minute knob situated about on the median line of the body of the fish. This knob is located about the middle of what appears to be the square-cut end of the hinder part of the body between dorsal and anal fins. At one time I thought this the beginning of the permanent caudal lobe such as is found on the adult (fig. 1). But it seems incredible that the larval tail should have disappeared and a beginning made of the permanent caudal lobe in the short time interval required for the growth from 2.8 to 5 mm.—an increase in length of only 2.2 mm. This knob must be the remnant of the tail seen in fig. 2. This region in the photograph under a glass shows a faint fuzziness, recalling the delicate embryonic fin-fold of a baby fish. To make this matter clear I have had this picture rephotographed and greatly enlarged, and I find that above and below and around this stump there is a faint tissue, which I interpret as a remnant of the disappearing fin-fold.

The thing to be emphasized here is that, in the short time interval between the 2.8 mm. larval and the 5 mm. post-larval stages, a great transformation has taken place, so that the pectoral fin seems about the only external structure that has come over relatively unchanged. The blunt serrate spines have been replaced by the typical slender striate thorns. Even more remarkable is the complete transformation of the massive dorsal-caudal-anal region and combination into very delicate and much smaller structures. Here is found a true metamorphosis.

A 10 mm. post-larva.—Under the name *Molacanthus* sp., McCulloch (1912) describes three young ocean sunfish

taken from the stomach of a kingfish captured in 1911 in the central Pacific between the Ellice and Union Islands. These measured 9.5, 10, and 13 mm. Of the two smaller the 10 mm. fishlet only was figured. This figure is reproduced as no. 4 herein. This fish, by reason of its shape and the number and position of its huge short spines, is easily recognized as a little *Masturus*. The 4 spines on the dorsum, the 3 on the venter, and the 7 or 8 on the side seen in fig. 4 are characteristic of this genus and species. They will be found in succeeding stages, and when gone their scars (seen in fig. 11) help in diagnosis.

Fig. 4.



A 10 mm. *Masturus* from the Central Pacific.
Note the curious tail structure. After McCulloch, 1912.

In McCulloch's figure the well-developed dorsal and anal fins are shown with fleshy bases apparently more developed than those of the 5 mm. specimen shown in fig. 3. These fleshy bases are set in indentations in the hinder end of the body, and between these bases the hind part has a very flat curve. In the centre of the curve, on what seems to be a flat basal surface, a fleshy pointed lobe or cone-shaped projection is found bearing 5 rays. Above this are 5 other rays, and below it 7. This lobe is slightly above the median level of the body.

The fin-rays can for the first time be easily counted: pectoral 11; dorsal 17; caudal 17 (5 above, 5 on the "thumb," 7 below); anal 15. And the dorsal + caudal + anal complex = 49 rays. This is smaller by about 8 or 10 rays than the count in older post-larvæ, but is what might be expected in such a small and young fish in which the caudal fin is not yet developed. In the base of the dorsal fin the fundamentals of the fin-rays are seen—their first appearance in our figures.

This caudal "thumb" with its 5 rays for a long time seemed to me to be the beginning of the caudal structure which will be figured and described in late post-larval fishes. But it can only be the remnant of the tail which has not yet become absorbed. However, the caudal rays can hardly be remnants, since there are none in the preceding stage. They may be anticipatory structures such as are to be found in the next stage.

The depth of this little fish is very great in comparison to its length, and the dorsal and anal fins do not point as do those shown from a photograph in fig. 3. These may be individual variations; there may be here a case of retarded development whereby this 10 mm. fish has not gone so far forward as has the 5 mm. specimen; or the figure (in all these doubtful points) may be what the artist thought he saw. These very small specimens are exceedingly difficult to draw. However, we may be reasonably sure that the caudal lobe (whether correctly drawn or not) is the remnant of the larval tail—but the presence of fin-rays on it is difficult to explain.

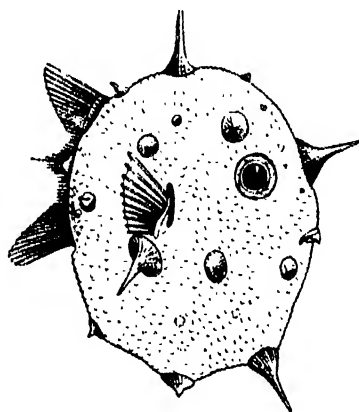
A 10.5 mm. post-larva.—This stage (from Schmidt, 1932) also has some of the long slender spines yet remaining but reduced in length. Of particular interest is the dorsal-caudal-anal region, which is beautifully developed, as may be seen in Pl. II. fig. 5—made from a photograph. Both dorsal and anal fins arise from definite bases. The hind end of the body seems to terminate in a gently concave surface connecting dorsal and anal bases.

The fin-ray count is pectoral, c. 10; dorsal 17; caudal 17 (5+ and 12); and anal 16. The D.+C.+A. complex is 50+. The + sign means that, both above and below the caudal lobe, the rays cannot be counted. Multiplication of caudal rays has evidently gone forward centripetally—i. e., toward the tail-stump, as noted by Tåning

in a letter to me. In a great enlargement of this figure the caudal lobe seems embedded in cloudy tissue which I take to be a remnant of the embryonic fin-fold tissue. The stump (here seen squarely) is smaller than that shown obliquely in fig. 3 (Pl. I.)—*i. e.*, it is still undergoing resorption. This was ascertained by having the two figures enlarged to exactly the same size.

The whole caudal complex—in structure and position of the fins—is clearly a stage in advance of that found in the 5 mm. fish shown in fig. 3, and the photograph might have been made from that identical fish grown older. Then, too (Pl. II. fig. 5), this 10.5 mm. fish is very different

Fig. 6.



A 13 mm. *Masturus* from the Central Pacific. Note the smaller caudal point compared with that in fig. 4. After McCulloch, 1912.

from McCulloch's 10 mm. specimen (fig. 4). The curious multiplication of fin-rays is very interesting. Possibly they are the upper and lower caudal rays, which are appearing ahead of the central lobe with its rays—*i. e.*, that the development of the caudal fin is, as Tåning suggests, centripetal.

A 13 mm. *post-larva*.—The third of McCulloch's specimens, 13 mm. long, is also figured by him (fig. 6 herein). It is very like the 10 mm. fishlet shown in fig. 4, but differs in three interesting and important points. First, the spines are somewhat shorter. Second, the bases of the dorsal and anal fins clearly show the fin-rays.

And third, the caudal lobe is shorter—by 3 mm. in the drawing—and smaller than the lobe of the 10 mm. fish portrayed in fig. 4. These things may all be seen in fig. 6. This fish is plainly older than that shown in fig. 4.

The pectoral fin is now so well established that no further count of its rays will be noted. For the other fins the count is : D. 14 ; C. 21 (8 above, 4 centre, 9 below); A. 15. The $D. + C. + A.$ complex = 50. There are too many fin-rays in the caudal lobe and too few in D. and A. Whether this is a variation in the little fish or in the drawing of the artist cannot be said. Probably, however, the latter conclusion is correct.

Summary.—The little fishes of this division are characterized by the presence of long striate thorn-like spines which gradually grow shorter, by the relative perfection of the pectoral fin, by a progressive development of dorsal and anal fins, and by the steady decrease in size of the tail remnant. With regard to the form of this, there is much difference between the lobe shown in Schmidt's *photographs* and that in McCulloch's *drawings*. Probably the drawings are in error, but it must again be emphasized that the correct drawing of such minute fish of such bizarre form and decorations is exceedingly difficult. Lastly, special attention is directed to the progressive centripetal development of rays from hinder dorsal and anal bases toward the caudal remnant.

The square-cut Tail of the Intermediate Post-Larvæ.

In the series of forms of this division, the caudal knob or remnant has disappeared and the caudal surface is square-cut—hence the name given to this group—but the tail-end rays persist. The little fish (17.4 mm. long), with which the series begins, is described, but unfortunately not figured. However, it fills a gap in my series and introduces us to a new form of baby *Masturus*.

A 17.4 mm. *post-larva*.—Gachet in 1832 described this small specimen from the Sargasso Sea. Because of its many large striate spines, he calls it *Orthagoriscus spinosus*, but the number and location of these spines enable one surely to identify it as a young *M. lanceolatus*. However, we are more interested in the tail-structures. Gachet states that the "posterior end is as if truncated

and this gives to the fish the appearance of being mutilated." The dorsal fin is placed in the same vertical line as the anal. It (D.) has 17 or 18 rays and "terminates in a certain number of fine transparent filaments." He counted 12 rays in the anal and noted that it, too, terminates in "transparent filaments." The tail is extremely short, 2.25 mm. "long" (front to back) and 6.75 mm. "high" (top to bottom). "There is no fin [*i. e.*, fin-rays ?] on the margin and it is cut off almost perpendicularly."

Gachet most unfortunately drew no figure. The "fine filaments" in the hinder edges of dorsal and anal are presumably similar to what may be seen in the fish shown in Pl. II. fig. 5. The shape of the tail is like that seen in figs. 7, 8, and 9—which, however, have fin-rays. It would seem that in this fish the primary caudal base (6.75 mm. high and 2.25 mm. deep or long) is the structure on which the tail-fin and lobe will later be developed. The lack of a figure calls for a study of the fish itself, but, alas! its fate is unknown.

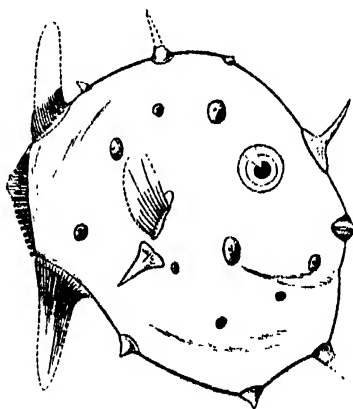
A 22 mm. specimen.—Schmidt (1921 (1)) found in the Copenhagen Museum a little sunfish taken in 1860 in the northern edge of the North Equatorial Current of the Atlantic Ocean. He gives the size of this as 20 and also as 23 mm.—but it actually measures about 22 mm. Schmidt gives no figure, nor does he describe the caudal fin, though he states that there are about 56 rays in the three unpaired fins. From this count and from the number and location of the spines, Schmidt identifies it as a *M. lanceolatus*. Dr. Tåning has been good enough to examine the specimen and have a sketch made for me with his count of the fin-rays as shown in fig. 7.

After 75 years in alcohol the little fish is in bad condition, especially with regard to the fragile fins, as fig. 7 shows. However, the number and position of the spines and the fin-ray count show that Schmidt was correct in calling it "a typical *Masturus*." Tåning's count of the fin-rays in the figure are—dorsal c. 17; caudal 21 (above 5+, in "thumb" c. 6, and below 10); and anal 18. And the tail-end combination = 56+, which is also Schmidt's count. Significant is the almost square-cut hinder part of the body with its remnants of the fin-rays. Note particularly the aggregation of 6 smaller rays just

above the median line of the body. This is the first indication of the structure which will be found common in older post-larvæ. The basal portion of the tail-fin is pretty clearly marked off, but the fin-rays are broken off at its edge. Fin-rays are entirely lacking just at the rear of the dorsal and at the beginning of the caudal fin—hence the + sign in the count above given.

A 24 mm. post-larva.—Steenstrup and Lütken (1898, fig. C, pl. iv.) figure a specimen of this size in the Copenhagen Museum. As may be seen in fig. 8 (an accurate outline sketch of their lithographed figure), this is surely a little *Musturus*, although it is labelled *Ranzania truncata*.

Fig. 7.



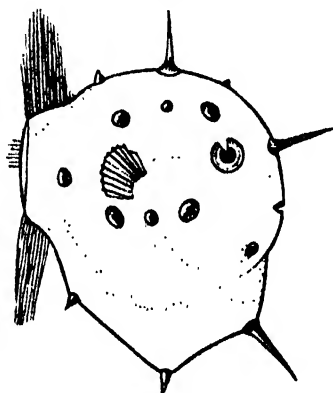
An almost square-tailed *Masturus* (22 mm. long) in the Zoologisk Museum, Copenhagen. Sketch by courtesy of Dr. A. V. Tåning.

It was taken in 1871 in the Atlantic off Teneriffe in the Canaries. The tail-region is nearly truncate between the hinder edges of the bases of the dorsal and anal fins, having a slight fleshy swelling extending from top to bottom. Above the median level of the body, where the fleshy lobe is widest, are found 7 rays. The remainder of the caudal is bare of rays. Probably these are lacking because the rays have been broken off—the dorsal and anal fins also show deterioration. The dorsal has 16 rays; the caudal 7 (above 0; centre 7; below 0); anal 10. The D.+C.+A. complex=33 rays—plainly the anal rays are partly gone. The caudal in this figure recalls the

form of this fin alleged in Gachet's 18 mm. specimen, where "The border . . . is cut almost perpendicularly," but differs from it in that it has 7 rays near the centre.

A 25 mm. post-larva.—Steenstrup and Lütken (1898, fig. D, pl. iv.) also figure a little *Masturus* but 1 mm. larger than that just considered. Their drawing is reproduced in outline as fig. 9. This is surely a young *Masturus*, which shows not merely a mutilation, but certain variations as well. The dorsal is gone save for the bases of 12 rays. Like the preceding specimen and figure, this square-cut fish justified to Steenstrup and Lütken their specific name (*R.*) *truncata*. The caudal has 10

Fig. 8.



The youngest entirely square-tailed *Masturus* on record—24 mm. long.
Redrawn from Steenstrup and Lütken, 1898, fig. C.

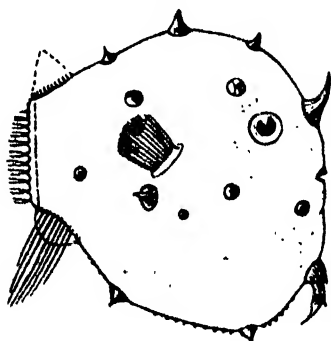
double rays + 1 single = 21. The anal has 10 rays set in a huge distinctly marked off base—a structure not found so accentuated in any other post-larval *Masturus* figured and described since McCulloch's 13 mm. specimen (fig. 6). Surely this fish is abnormal, as are the massive jointed (?) spine on the throat and the large recurved one on the forehead. This specimen is from the Paris Museum without indication of place or capture. It was presented to the Museum in 1847.

Late in this study there came to me a doubt as to the accuracy of Steenstrup and Lütken's drawings (my figs. 8 and 9) of their little specimens. But they were careful workers. Moreover, Schmidt (1921 (1)) with these speci-

mens before him did not criticise their drawings. He had photographs made of the fishes shown in my figs. 8 and 9. They are reproduced as coarse half-tones on a black background on soft paper. By holding the page of figures up before a strong light, I have been able to see in the figures the same spine and tail structures that are figured by Steenstrup and Lütken—i. e., the figures are identical. The resemblance of these caudals to that shown in fig. 7 must again be emphasized.

Summary.—The little fishes of the intermediate stage of the post-larvæ of *Masturus* are characterized by great diminution in size of the slender spines—they are nearly gone in the 24 mm. fish. The caudal region between

Fig. 9.



A 25 mm. square-tailed *Masturus*.
Redrawn from Steenstrup and Lütken, 1898, fig. D.

dorsal and anal is square-cut in Gachet's 17.4 mm. fish, nearly so in the 22 mm. specimen, and entirely so in the 24 and 25 mm. fish. As may be seen in figs. 7, 8, and 9, the caudal region has attained that condition in which it is now ready for the development of the secondary caudal fin—as will be seen in fishes of the next group. In fig. 7 there is shown an almost full complement of caudal rays. Their partial appearance in figs. 8 and 9 may be due to fragmentation with age and handling.

Finally, it must be emphasized that the square-cut caudal region shown in these figures is almost identical with what Schmidt (1921 (1)) and others have found and have figured in young *Molas* of the same size (15, 19.5 mm. long) and stages of development. Evidently this is a

structure common to the developing young of the Molidae. Undoubtedly a like square end will be found on little *Ranzanias* of these stages.

*The developing Secondary Tail
of the Late Post-larvæ.*

Beginning with the youngest fishes of this division, the little specimens of *Masturus* have a caudal structure so characteristic that it sets this group definitely apart from the preceding. The earliest specimen is somewhat transitional, but the others form a close series leading up to a post-larva whose tail-form approximates that of the adult. In the little fish first to be considered the peculiar post-larval caudal structure makes its first appearance in a rather imperfect form.

External Structure of the Secondary Tail.

In this section the developing tail-fin and caudal lobe are studied primarily in external view—i. e., with the little fish before one in a dish of alcohol. However, in some specimens the tail-fin is so thin that by holding it before a good light the fin-rays can be traced back to the body and even some idea can be got of the rays in the lobe. Other than this no artificial means have been used here to get at the inner make-up of the tail-fin.

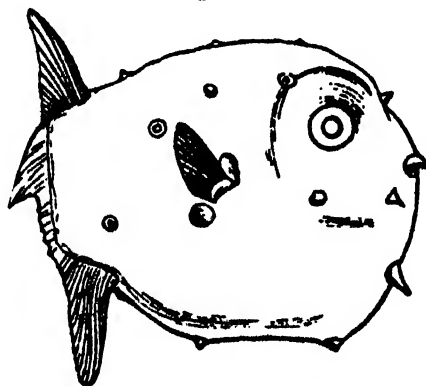
A 32 mm. fish.—Günther (1880, p. 175) figures (no. 10 herein), but does not describe, a young fish of this size from the north-west of the Tuamotus, Central Pacific Ocean. He calls this *Orthogoriscus mola*, but inspection of the spine remnants in fig. 10 shows that it is a young *Masturus*. However, the tail, which is above the general level of the body, is very unlike that of any other pointed tail. Noticeable in fig. 10 is the square-cut hinder end of the body between dorsal and anal fins. The caudal fin looks to be abnormal, but the downward slant of the tip is possibly due to bending when the fish was first put in alcohol. In the figure there are 15 dorsal rays, 2-5-8 in caudal, and 15 in anal—a total of 45 in D. + C. + A. combination. The count is certainly incorrect. Note the uneven spacing of the caudal rays in the figure—apparently poor drawing.

This little fish in Günther's figure is so unlike any other (save one) found in this study that I sought and, through

the courtesy of Mr. J. R. Norman of the British Museum, obtained the loan of it. Although captured prior to 1880 the little fish is in good condition save as to dorsal and anal fins.

It is a satisfaction to have had this specimen at hand and to have been able to examine it carefully. But it is so small and the fins, after all these years, are so fragmented that very delicate handling was necessary. As best I could make out there are about 16 or 17 rays in the dorsal and about 12 or 13 in the anal. The rays (9) in the lower half of the caudal are quite clear, but the upper half of the fin is fleshy and the (6) rays hard to count. The central point is fleshy, and even with special lighting

Fig. 10.



The smallest (32 mm.) recorded *Masturus* with a transitional pointed tail. After Günther, 1880.

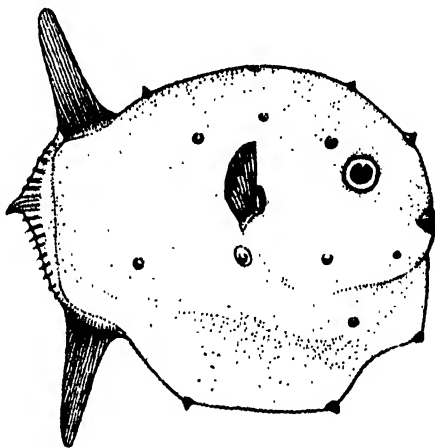
I could make out no rays. If present, these must be very fine and delicate, but probably they could have been counted when the fish was fresher. The filament, when straightened out, is similar to that next to be described. It is about on the median line of the body. Günther's figure is on the whole a pretty accurate drawing.

A 34 mm. young.—Collett (1896) found in the Christiana Museum a little *Masturus* taken in the Sargasso Sea in 1877. It measured 34 mm. in length. He states that dorsal and anal are normal, but gives no fin-ray count. The caudal was well developed with short but distinct rays (count not given). A little above the middle of this fin was a filament made up of elongated

rays coming to a point beyond the other rays, but not so long as that figured by Perugia (fig. 12 herein). Here again there is no count of rays, and, most unfortunate of all, Collett gives no figure, but his description, including the enumeration of the 4 spines on the dorsal and the 3 on the ventral "profil," leaves no doubt that it was *Masturus*. He did not know what a treasure he had.

Since writing the above, through the kindness of Mr. Wollebaek, curator of the Zoologisk Museum in Oslo, this little specimen has been sent to me. It is accurately portrayed in fig. 11. It is 34 mm. long (37 to point of

Fig. 11.

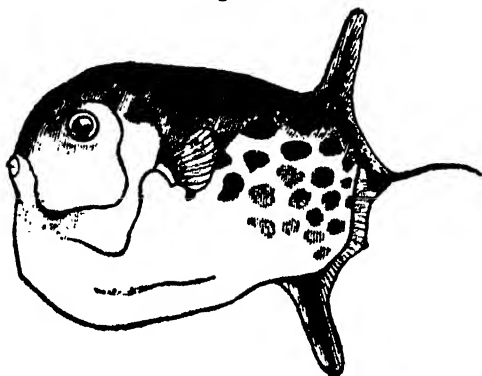


The smallest (34 mm.) figured *M. lanceolatus* with a perfectly formed pointed tail. Drawn from a specimen loaned by the Zoologisk Museum, Oslo.

lobe), and its fin count is dorsal c. 17, caudal 19 (6 above + 4 in centre + c. 9 below), and anal 19. The D. + C. + A. complex is c. 56. The count is doubtful at the junction of caudal with dorsal and anal. These fins are set on bases insunken in the curves of the body. The body (not the tail) is square-cut behind. This is a morphological structure—so definitely established that no further mention will be made of it. The caudal fin is a distinct entity. The central part, made up of 4 fine rays, is distinctly above the median line of the body, the filament is hooked downward as in Günther's specimen.

The similarity of this little fish (fig. 11) to Günther's specimen (fig. 10) is remarkable. They look as though they might have been hatched from the same batch of eggs. Yet Günther's fish was taken from the central Pacific north-west of the Tuamotus about 1877 or 1878; the Oslo fish in the Sargasso Sea, curiously enough about the same time—1877. I had at one time thought that Günther's specimen was abnormal, but study of the fishlet itself and of the Oslo specimen along with it effectually banishes this conjecture. They are plainly of the same stage.

Fig. 12.



The earliest figured *Masturus* (35 mm.) with a caudal whiplash, and the only one with spots. After Perugia, 1889.

A 35 mm. specimen.—In 1882 4 young were taken from the stomach of a dolphin (*Coryphæna*) captured off Pensacola, Florida (U.S.A.). These were deposited in the Civic Museum of Natural History in Genoa, and in 1889 were described by Perugia and the smallest fishlet (35 mm.) figured (fig. 12 herein). This late post-larva had a well-developed filament placed well above the median line of the body and composed of four greatly elongated rays. This fin, measured from the base of the caudal, was 14 mm. long and the whiplash extended 5 mm. beyond the fin proper. The other specimens were 39, 42, and 50 mm. long respectively. All had caudal filaments which were found to be progressively shorter the larger the fish.

The fish shown in my fig. 12 is the only juvenile form found figured or described in this study to have on the

upper and hinder parts of the body the spots so characteristic of the adult. One wonders if they are correctly drawn, especially when note is made of the second and lower point in the caudal fin. This doubt is increased when the fin-rays are counted—dorsal 28; caudal 67 (27 above, 4 in filament, 37 below); anal 19. The D.+C.+A. combination=114. Even if one counts in the lower caudal only those rays that reach the edge of the fin, the number is 25 and the total is reduced to 109. Yet, despite the inflamed imagination of the artist, this is surely a young *Masturus*.

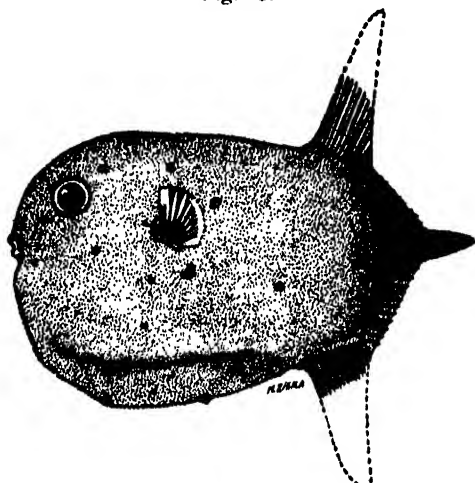
Between this last stage (35 mm.) and the next (47 mm.), there is a considerable hiatus, but no young fish intermediate in size has as yet been figured and described. However, in the last fishlet, despite the bad drawing, the characteristic post-larval form and structures are so well established (fig. 12) that the transition to the 47 mm. fish involves nothing unusual. However, one cannot but wish that Perugia had figured his 39 and 42 mm. young so that the gradation might be closer.

A 47 mm. post-larva.—In the U.S. National Museum are three young pointed tails taken off Greytown, Nicaragua, in 1869. After these long years in alcohol they are in bad condition—dark brown in colour and with battered fins. The general data are found in the accompanying table. For a full description of these specimens see Gudger, 1935. These must be the three little moldid fishes which Gill (1884) says that he examined. Their measurements and fin counts follow :—

Data for three young <i>Masturi</i> from off Greytown, 1869.						
No.	Length.		Fin-ray count.			
	Standard.	To tip caudal.	Dorsal.	Caudal.	Anal.	D.+C.+A. combination.
1 ..	43	47	c. 18	7+4+10	17	c. 58
2 ..	47	58	15	9+4+12	c. 16	c. 56
3 ..	60	70	17	8+4+10	16	55

These fishlets form a good series and have a markedly uniform fin count. The second fish is the best specimen, has the best tail, and as a good representative of the group is shown in fig. 13. All three of these fish have the base of the caudal fleshy, too thick for fin-rays to be traced to the body. In all, the filament arises above the median line of the body. In no. 1 this is broken off, leaving a 4 mm. stump, but this is composed of 2 outer and 2 inner rays—as is shown for no. 2 in fig. 13. In this latter specimen the 2 inner rays seemingly break

Fig. 13.



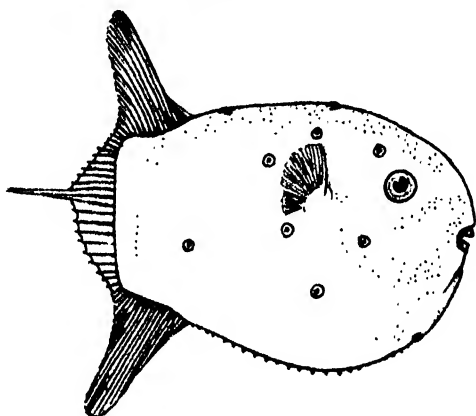
Young *Masturus* (47 mm. long) with a pointed caudal lobe. After Gudger, 1935.

up at their tips into fine fibres, giving the tip a paint-brush structure. No. 3 (60 mm. long) has the tail-filament decidedly spatulate in shape with 2 outer rays and with the two inner ones breaking up into fine fibres as shown in fig. 13. Reference to the external form and internal structure of this spatulate filament will be made later.

A 47.5 mm. fish.—Steenstrup and Lütken (1898) figure and describe a specimen of this size taken from the stomach of a *Coryphæna* collected off the Azores. It is shown in fig. 14. The total length of caudal fin and filament is 17 mm. and the free filament measures 11 mm. The drawing shows it to be made of 3 rays.

Both in Steenstrup and Lütken's lithographed figure and in my line cut reproduction of it (fig. 14) it is very difficult to say where dorsal and anal fins leave off and the caudal begins. As best I can make out, the count is dorsal 17 or 20; caudal 18 or 21 (6 or 9 above, 3 in filament, 9 below); anal 20. The D.+C.+A. combination = 58 rays. Not only the fin-count and tail-filament, but also the number and position of the spine-scars tell us surely that this is a little *Masturus*. Incidentally it may be remarked that Steenstrup and Lütken were the first to make use of the long post-larval spines or their scars as diagnostic characters.

Fig. 14.



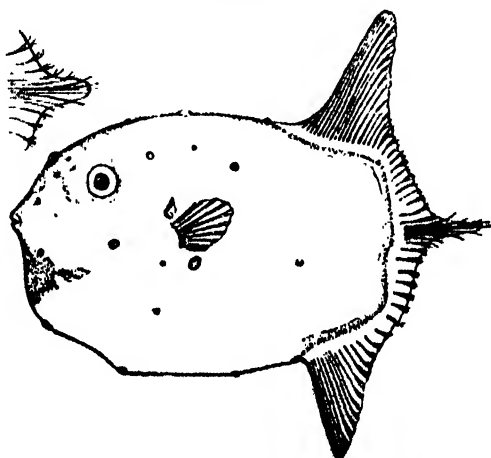
A whiplash-tailed *Masturus* 47.5 mm. long.
Redrawn from Steenstrup and Lütken, 1898, fig. E.

Schmidt (1921 (1)) had a photograph made of this fish (in the Copenhagen Museum). This is reproduced with a black background on soft paper. No count can be made of dorsal and anal rays in this figure with any degree of precision, but the caudal has 6 or 9 (probably the latter) above, 9 below, and 3 in the "whisker." However, in this Schmidt says (1921 (1)), p. 9, that there are 7 or 8 rays. This discrepancy may possibly be cleared up by the explanation found later.

A 50 mm. fishlet.—In 1886, without giving locality or date of capture, Ryder figured a young *Masturus* from the collections of the U.S. National Museum. This

is shown in my fig. 15, and at the upper left is shown the caudal lobe only of a "somewhat older specimen." Ryder's description is very general and unsatisfactory. He calls attention to the divergent horny rays in the lobe and notes that they are twice as long as the rays above and below. He thought this specimen to be a young *Mola* and that this whole tail-structure disappeared and a new one developed for the adult *Mola*. By comparing this drawing with figs. 11 to 13, it is seen to portray a perfectly normal young *Masturus*, tail-lobe, horny fibres, spine-

Fig. 15.



A 50 mm. *Masturus* with a peculiar pointed lobe.
After Ryder, 1886.

scars and all. The base of the caudal seems to be thick, since the fin-spines evidently could not be traced clear back to the body.

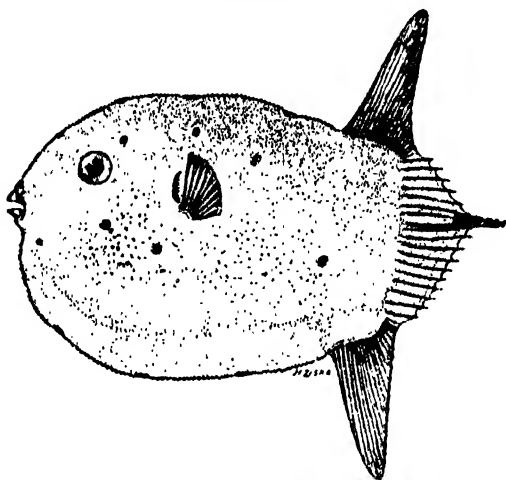
Ryder does not indicate the size of his specimen reproduced as my fig. 15. Presumably it was drawn natural size—50 mm. He does not give the fin-ray count, but the figure (no. 15 herein) has: dorsal 19; caudal 25 (10 above, 6 in lobe, and 9 below); and anal 15. The D.+C.+A. complex = 50. The fin-ray count and the number and location of the spine-scars surely pronounce the fish a young *Masturus*.

Particular attention is called to the fact that each tail figured by Ryder has the pointed lobe or "thumb"

characteristic of the adult tail, and that each lobe has 6 rays embedded in it—and that each central ray breaks up into 3 threads. This is very similar to what I have found in the five little fishes which I have studied in the course of this research.

It is unfortunate that Ryder does not give the number of his specimens and their source. He surely had two fish. At one time I thought that these were the Greytown fish. But these are three and their tails are quite different. Compare figs. 15 and 13. Probably these latter come from

Fig. 16.



A young pointed-tailed ocean sunfish 53 mm. long with a short whiplash. After Gudger, 1935.

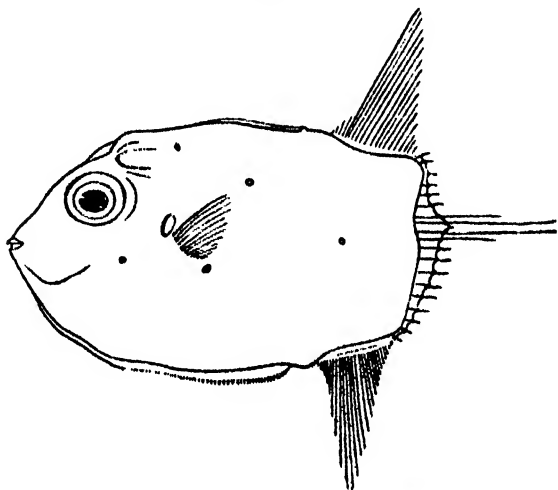
the Atlantic, but they have disappeared and their history cannot be traced.

A 53 mm. *Masturus*.—The Museum of Comparative Zoology at Cambridge, Massachusetts, has two young pointed tails of the same approximate size taken from the stomach of a *Coryphæna* captured in the north Atlantic in 1880 by the 'Blake' expedition. One is so mounted that it cannot be loaned, but Dr. N. Borodin, Curator of Fishes, has kindly sent me the other for study. It is shown in fig. 16. The fin-ray count is: dorsal 21; caudal 20 (5 above, 4 in centre + 2 extra fibres, 9 below); anal 20. The D. + C. + A. combination is 59 or 61. The

body is 53 mm. long, and the caudal- \dagger filament add 12 mm. more (65 mm. in all). The filament has 4 rays in the base and 6 fibres in the tip, there being two supernumerary raylets. As the figure shows, this tail-fin is markedly unlike that of the fish from the U.S. National Museum just studied—not fleshy, but composed of a thin membrane in which the fin-rays are perfectly visible clear back to the body. For a fuller description of the fish see Gudger (1935).

A 54 mm. *Masturus*.—At the meeting in 1870 of the American Association for the Advancement of Science,

Fig. 17.



A 54 mm. post-larval *Masturus* with diffuse scattered rays in the point of the tail. After Putnam, 1871.

Putnam (1871) reported on four young sunfish from Massachusetts Bay. These he designated as *Orthogoriscus mola*, but his crude figure of one (no. 17 herein) plainly shows it to have been a young *Masturus*. The other three fishes were of about the same size and presumably had the same tail-structure. The caudal (with its point above the median line of the body) seems to be composed of a thin membrane through which the rays can be traced clear to the body. Barring the straight prolongation of the 4 central rays, this fin is very like those shown in figs. 12 to 16.

The fin-ray count of this little fish (in fig. 17) is : dorsal 21 ; caudal 19 (6 above, 4 in lobe, 9 below) ; anal 27. And the D.+C.+A. combination is 67—plainly an excessive number. The whole figure is poorly drawn, the tail especially so. Probably Putnam did not check up on his artist. There are surely too many rays in the anal.

The history of these four specimens is interesting. Putnam (1871) says of them that they were " in the Peabody Academy of Science, having been received from the Essex Institute, in whose collection they had been for many years." Letters to the Peabody Museum at Salem brought the information that they had disappeared long ago. However, Dr. Borodin found in the Museum of Comparative Zoology a young partly dissected fish which had been transferred from the museum of the Boston Society of Natural History. Accompanying this was this note on the record " F. W. P[utnam] has the specimen in Salem." Putnam indicates in his article that he dissected one or more of his specimens, and this fish (before me as I write) is surely one of them. It is possibly the fish shown in fig. 17—at any rate, the mouth, eye, forehead, spine-scars, and ventral serrated keel (which is partly detached) are identical. So is the tail-structure, as noted in the next paragraph.

This little partly dissected fish after all the years is in very bad condition. The fin-ray count is difficult to make, but after many careful efforts it may be stated approximately as follows :—dorsal c. 22 : caudal c. 19 (6 above, 4 or 6 in centre, c. 7 below) ; anal c. 18. The D.+C.+A. combination = c. 59. The most interesting structure is, of course, the stump of the filament. The double count (4 or 6) of its rays arises as follows :—the two ventral rays are single normal horny fibres, but the two dorsal ones are double. The bases of these are gone, and it cannot be said whether these are four separate but closely appressed rays, or whether they are each a single ray broken up into two fibres as certain rays seen in figs. 13 and 16 seem to be. If this fish is the identical one figured by Putnam, then it can readily be understood how defective his figure (no. 17 herein) is.

Neither Putnam (1871) nor Ryder (1886) (who knew of and, as will be seen later, commented on Putnam's

work) knew of Liénard's report (1841) and figure of *Masturus*. Ryder did know of Bleeker's specimen (1873) and of Gill's establishing the genus *Masturus* in 1884, but he did not realize that he and Putnam had had the young of that fish. Each thought that he had the young of a hypothetical genus called *Molacanthus* or the *Molacanthus* stage of *Mola*. Thus Ryder says:—

“It is clear that in the *Molacanthus* stage the first signs of what represents a caudal in *Mola* appear as very short rays included by a narrow fold of epiblast or skin, which grows in height as the rays lengthen, and approach the condition which they present in the young of *Mola*. But the development of the median caudal rays to a length exceeding twice that of the rays above and below them in young specimens of *Mola* shortly after they have passed the *Molacanthus* stage is very remarkable, since, as the fish increases in size, this tail-like extension of the middle rays of the caudal disappears, so that the margin of the whole tail-fin assumes a moderately convex or gently rounded outline when viewed from the side. This prolongation of the central rays of the caudal in the young *Mola*, however, assumes a striking significance when compared with another closely related adult form pertaining to the *Molina* first described and figured by Bleeker, and now known as *Masturus oxyropterus* (Blkr.) Gill, which has the central rays of the caudal very much prolonged and slightly divergent, as in the young of *Mola*, the backwardly projecting central part of the tail being also armed with a pair of dermal plates. This condition of parallelism in the development of the central rays of the tail of the young of *Mola* and of the adult *Masturus* would indicate that the latter has retained in the course of its evolution a characteristic which is only a transient feature of the evolution of *Mola*.”

Ryder and Putnam (but especially the former, who was an embryologist) each thought that he had young specimens of *Mola* and that this curious median tail structure was an embryonic thing which in the course of development disappeared and left the rounded tail of the adult *Mola*.

Even Gill, with his prodigious knowledge of fishes, fell into error concerning these little molid fishes. In

1884 he set up a family, Molacanthidae, with the single genus *Molacanthus* to include all described small ocean sunfishes. Here he erroneously grouped various described young molids, some the young of *Mola* and others of *Masturus*. This error persisted until the facts were made known by Schmidt (1921 (1, 2); 1926; 1932).

A 60 mm. pointed-tail.—This fishlet, one of the three from off Greytown, Nicaragua, in the U.S. National Museum, is the largest post-larva known. Moreover, it had a spatulate lobe placed above the median level. Unfortunately, before I had fully grasped its value for this study, I had had this specimen stained and cleared for the internal structure of the tail—with disastrous results. The fate of this fish will be given in the next section along with a drawing of this spatulate lobe. When it came to me the little fish measured 60 mm. in standard length, but 70 to the tip of the caudal. Its fin-ray count was: D. 17, C. 22 (8+4+10), A. 16, and the D.+C.+A. compound = 55. This is a rather low count, and the lowest of the three Greytown fish. For the form and structure of the caudal lobe see fig. 21. The lack of a figure of the whole fish is greatly regretted.

Summary.—The observations, figures, and descriptions of the late post-larval *Masturus* have little to do other than with the development of the caudal lobe and fin-rays of the secondary tail. This is the last external organ to be formed, and the energies of late post-larval life seem to be almost entirely devoted to its development. I am fortunate in being able to present a series of figures (nos. 10–17) showing stages in the development of the central part of the secondary tail of *Masturus*. As figs. 10 and 11 show this begins in rudimentary fashion; the central rays elongate into a whiplash (figs. 12 and 14); this becomes reduced to a rather short point (figs. 15 and 16); and, finally, the lobe with its supporting rays becomes spatulate, as will be shown later in fig. 21. These changes take place in little fish ranging from 32 to 60 mm. in length.

Internal Structure of the Late Post-larval Tail.

Although heretofore but two attempts have been made to elucidate this, I am fortunate in being able to present drawings showing the internal make-up of several late

post-larval tails. Two of these show (one rather imperfectly) the whole skeletal structures, others show only the tail-fin or the caudal lobe. But they all tie up closely with the facts set forth above.

A 53 mm. specimen.—Putnam (1871), as noted above (p. 23), dissected a 53 mm. fish taken in Massachusetts Bay. Without saying that he had made a dissection or drawing and without publishing the drawing he had made (fig. 18 herein), Putnam wrote (1871) as follows of what he thought to be a little *Orthogoriscus mola* :—

“Several interesting points were mentioned in connection with the skeleton of the young, and the changes which take place in its growth. The neural spines of the fifth to the fifteenth vertebræ are closely packed together with the interneural spines, and extending backwards support the dorsal fin ; while the hæmal spines of the tenth to the sixteenth vertebræ are in close connection with the expanded interhæmal spines supporting the anal fin. The sixteenth vertebra gives off large neural and hæmal spines, the former having five interneural spines ankylosed with it as in the adult ; while the hæmal spine supports nine interhæmal spines, the lower one of which belongs to the anal fin, while the others are of the caudal chain. In the adult [*Mola*] only seven interhæmal spines are connected with this hæmal spine. The seventeenth vertebra in the adult lies in the caudal chain of interspinous bones, and, from its being separated from the vertebral column, has been as often considered as an interspinous bone as a vertebra. In the young specimens this vertebra, though separated from the column as in the adult, has in close connection with it two bones above and two below [3 ?] probably indicating that this vertebra is in reality the consolidation of two [3 ?] vertebral bodies, the seventeenth and eighteenth ; while two other small (neural and hæmal) bones posterior to this free vertebra indicate that a nineteenth vertebra existed at an earlier stage. These six neural and hæmal (three each) bones disappear in the adult [*Mola*], and with them the central rays of the caudal fin ; and they and the seventeenth, eighteenth, and nineteenth vertebræ are only represented by the free or ‘floating’ seventeenth vertebra which lies in the chain of interspinous bones of the caudal. This is the only instance of a vertebra

existing as distinctly separated from the vertebral column known to the author."

Putnam thought that he was dealing with a young *Orthogoriscus* (*Mola*), and, without a figure (fig. 18 herein), what he wrote is unintelligible. He labels his article "Abstract" and in a footnote promises a full paper illustrated "with several plates." As we shall see, he drew at least one of these, but the promised memoir was never published. However, 15 years later, Ryder (1886) published an article "On the Transformations of the Tail of *Mola*," illustrated by a figure (my no. 15) of a 50 mm. *Masturus* as noted above, showing the external make-up. Ryder knew of *Masturus*, but was convinced that he had a young *Mola* (his figs. 5 and 6=my no. 15), and hence he missed the whole point.

He cites the quotation from Putnam given above, tries to make everything fit *Mola*, reproduces as his fig. 8 (but nowhere in his text refers to it) Putnam's drawing which was the key to the enigma. Here is his caption to this unmentioned drawing (my fig. 18). If this caption and the quotation from Putnam are studied in connection with my fig. 18, the obscurities in the work of the two men will be fairly well cleared up. Here is what Ryder wrote for the figure in question (my no. 18):—

"Caudal skeleton and part of the muscles of the young of *Mola* in the condition [stage] of fig. 5 [fig. 15 herein], somewhat altered from a MS. figure by F. W. Putnam, in order to show the dichotomous caudal rays, which seem to be partly aborted in the central portion as the animal becomes adult, and to undergo other retrogressive changes."

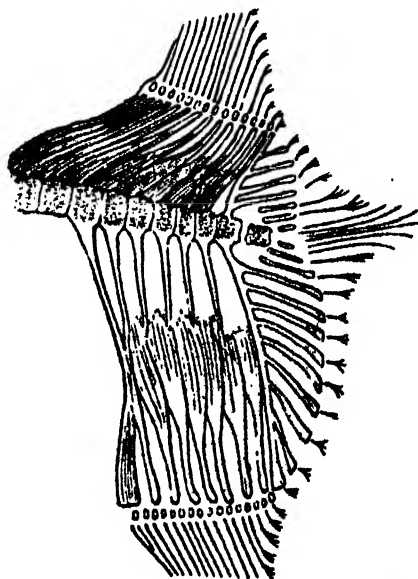
There is nothing herein to explain the curious branched basals from which the fin-rays extend outward. Ryder states that it is clear that "the embryonic axis or chorda is not prolonged into the central prolongation of the tail . . . because this median extension is a secondary formation and not a part of the primitive larval axis." Further on he notes the floating vertebra at the end of the spinal column, but does not comment on it as an apparent basis for the rays constituting the central "point" of the tail. Finally, he states his main thesis that "there actually occurs in *Mola* a secondary development of the tail, by which that organ is, so to speak, re-developed

from traces of epaxial and hypaxial tissues which had not been absorbed at the time the tip of the larval axis degenerated."

What Putnam had by dissection and what Ryder had in Putnam's drawing (fig. 18 herein) was the caudal skeletal structure of a young *Masturus* about 53 mm. long. Neither man knew what a treasure he had. This figure deserves careful study.

Taking first the fin-ray count we find: dorsal 18; caudal 24 (7 above, 6 in lobe, 11 below); anal 18. The

Fig. 18.



Skeletal structure of unpaired fins and hind end of body of *Masturus*.
After Ryder, 1886, modified from a drawing by Putnam.

D.+C.+A. complex=60. The caudal skeleton is extraordinarily interesting—there is nothing like it among other fishes. Coming off the last vertebra but one (Ryder's no. 16) are two multi-branched neural and hæmal spines. The neural branches into 5 and the hæmal into 9 secondary bars which serve as points of origin for their respective fin-rays. The seventeenth vertebra is free from the spinal column—a "floating vertebra"—and has adjacent but not attached to it 3 dorsal and 3 ventral

bars. The two outermost above and below serve each as the base for a fin-ray branched at the tip. Each of the inner ones seems to be the point of origin for a simple hair-like fin-ray. Lastly in the centre are 4 slender non-branching fin-rays. The origin and relationships of these are obscure, since there are no bars at their bases as there are for all others. The caudal lobe then has in all 6 non-branching slender rays, which apparently are based on 2 bars only.

There is every reason to believe that the partly dissected little *Masturus* sent me from Cambridge is the identical fish that Putnam studied and from which he made the drawing reproduced as fig. 18. But, alas! it is in such bad shape that I cannot make out in it the elements of the caudal skeleton. It may be that, after making his drawing, Putnam dissected deeper, but, at any rate, after these more than 65 years in preservative, the tissues are in such shape that I can make out but few of the structures shown in fig. 18.

In hope of verifying Putnam's drawing (fig. 18) showing the skeletal structure of the D.+C.+A. complex of the young *Masturus*, I wished to study this in two young fish by means of alizarine staining and KOH clearing. The dangers of this to the specimen from the Museum of Comparative Zoology (fig. 16) 64 years in preservative, together with the benefits if it turned out well, were set before Dr. Thomas Barbour, Director. Without hesitation he wrote "Specimens are had to be used. Try your method on our fish and success to you." And when he saw that the little fish had gone to pieces, he merely said, "Well, you got at least some of the internal structures. Keep the fish and we will arrange for an exchange."

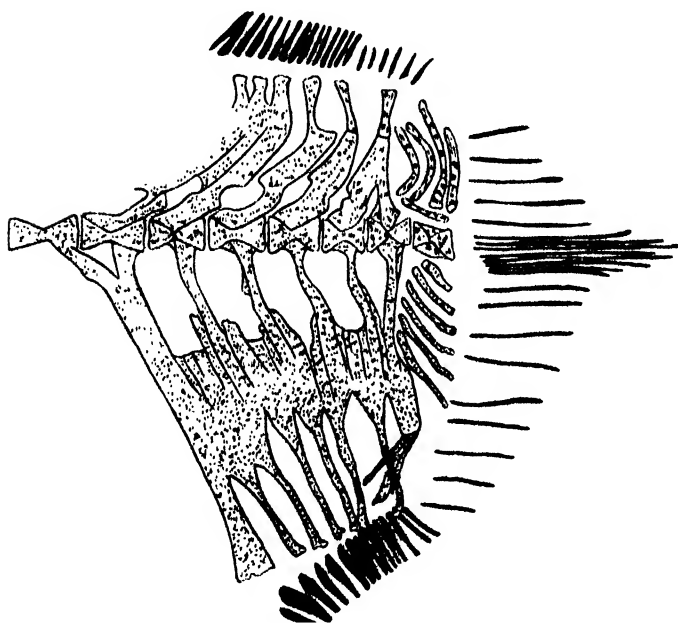
Another 53 mm. fish.—The task of staining and clearing this specimen was kindly undertaken by a member of Dr. William Beebe's staff, Miss Gloria Hollister, who is exceedingly expert in using this method. She was very dubious as to the outcome of these reactions on a 64-year old fish, but went ahead with it. The little *Masturus* took the stain but did not clear well, save in the thin caudal region, and this went to pieces badly.

Miss Hollister had the little fish in Bermuda, and, seeing that it was in bad shape and fearing that it would break up further while being brought to New York she

made a sketch of the tail-end skeleton and sent this to me. This was most fortunate, for when the fish did reach me the parts of the tail complex had separated badly. Miss Hollister's sketch of the partly disorganized hind end structures is reproduced as in my fig. 19.

The fin-ray count with two exceptions agrees with that found in the unstained fish (fig. 16). The dorsal

Fig. 19.



Hinder end and unpaired fin-skeletal structures of the 53 mm. *Masturus* shown in fig. 16. Redrawn from a sketch by Miss Gloria Hollister.

has 21 rays, 15 long ones + 6 small ones at the junction of the dorsal with the caudal. This latter has 5 rays above, 8 in the centre, and 9 below. The total is 22, against 18 or 20 in the figure of the fish (no. 16 herein). In my original description I counted only 4 rays in the lobe, not being sure about the 2 fine fibres. This discrepancy of 4 or 6 rays will be explained later. The anal in the unstained specimen has 20, in the stained fish 16 rays—4 have evidently come loose and drifted

away. The D.+C.+A. combination in fig. 19 is 58 against 59 (+2 extra in filament) in fig. 16.

If fig. 19 is compared with fig. 18 the absence will be noted of the dichotomous branching hæmal and neural hindmost rays. The main stem of each is gone, but above we find the 5 (badly displaced) basal elements from which the 5 upper rays arise, and below are the 9 basals which support the 9 lower rays. The floating vertebra is in place, but the free basals seen in fig. 18 are absent. This lack may be a matter of variation, more probably these rods have become lost in the clearing process.

Above there are only 6 neural rays shown. The first and last of these apparently have abnormal bases and the three anterior seem coalesced. Putnam has 13 (fig. 18). Plainly about 7 anterior ones are not shown. Below there are 6 hæmal spines, as in Putnam's figure. The anterior of these apparently has a double base like the hinder one above. These basals all coalesce in the centre and give rise outwardly to forks for the anal fin and one which gives off the three basals of the lowermost three caudal rays.

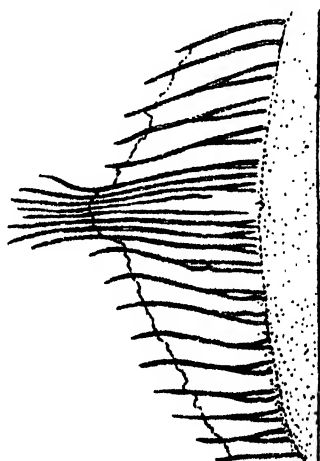
Assuming that the Ryder-Putnam figure is a correct one, there are in the figure of the stained tail some wide divergences. These may in part be due to variations, but are in some cases at least due to breakages and displacements, and in others probably to parts floating above and resting on others—thus possibly giving the appearance of fusion of parts. How one wishes here for fresh little fish to be stained and cleared to show every skeletal part without the displacement of a single structure.

The internal structure of the caudal lobe of the specimen from the Museum of Comparative Zoology is still to be studied. In Miss Hollister's sketch (fig. 19) this has 8 rays. The fin-ray structure of the stained lobe is shown in fig. 20. The stained fin has torn loose from the body but still is intact in itself. Spread out and drawn under the microscope it presents the appearance shown in fig. 20. At first it seemed that there were 9 or 10 rays in the lobe, but careful focussing and study showed that this appearance was due to seeing at one time the right and left halves of certain dermal fin-rays. Careful study shows that there are but 8 rays in the caudal as

portrayed in fig. 20. One ray seems to have but one leg of the base, and another had the base torn off.

A 60 mm. fish.—It will be recalled that of the three small ocean sunfish in the U.S. National Museum (taken off Greytown, Nicaragua), the largest measured 60 mm. Advised of the possible danger to the specimen, Dr. G. S. Myers, Associate Curator of Fishes, nevertheless kindly gave permission to stain and clear one of these 66-year old fishes—no. 3 in the table on p. 19. The little fish took

Fig. 20.



Fin-ray structure of stained and cleared tail of 53 mm. fish.
Drawn from tail of fish shown in figs. 16 and 19.

the stain poorly and did not clear at all, besides disintegrating badly in the tail region—in fact, the whole tail-fin came loose and fell away from the body. A description of this tail-fin lobe follows.

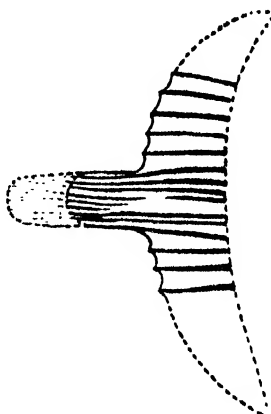
A few caudal rays are left in the tail as shown in fig. 21. The spatulate caudal lobe is in bad shape, but the stain brought out the internal structure clearly. In the upper half 3 rays can be traced from the body-line clear out in the tip. A like number is found below. Between these 1 ray arises in the body-line but does not reach out into the lobe. In the lobe are three central raylets

which have no apparent basal connection with the body. The tip of the lobe though broken off was preserved. It is shown in dotted outline, presenting very much the appearance of a flat paint-brush made up of nine hairs.

Since the figure (no. 21) was drawn and the above description was written this caudal lobe has disintegrated. I have doubts as to the total number of rays (9 ?) in the caudal lobe. I suspect that some of them are the two separate parts of one and the same ray.

As this is being written, this question comes to me. What is the significance of the spatulate or lobed tail

Fig. 21.



Spatulate caudal lobe of the largest (60 mm.) recorded post-larval *Masturus*. Drawn from a specimen from the U.S. National Museum.

of this the largest post-larval *Masturus* ever seen? Can it be a forerunner of the spatulate or spade-shaped lobe found in so many adult fish? I believe that it is, and that this little fish was a small edition of the adult whose spatulate tail is shown in fig. 26. This conclusion is strengthened by study of Schmidt's figure (1921 (1); 1932) of a 53 mm. *Ranzania truncata*. This figure portrays an absolute duplicate of the adult *Ranzania* shown in Steenstrup and Lütken's photograph (1898, p. 55). Too late, I bitterly regret that I did not have a drawing made of my 60 mm. young fish before the attempt was made to stain and clear it.

STRUCTURE OF TAIL UNKNOWN FROM LATE POST-LARVÆ TO YOUNG ADULTS.

Between the largest post-larval sunfish of 2.35 in. (60 mm.) and the smallest adult, 30.5 in. long, there is a great and distressing hiatus. So far as I can find by a careful search of the literature, no intermediate-sized fish has ever been recorded. The smaller sizes of these are apparently too large to be taken by dolphins—from which have been obtained a considerable number of the late post-larvæ described. Furthermore, they are apparently too large and too active to be taken in tow-nets. They probably stay in the Sargasso Sea (where they are born) unless caught in ocean currents and carried away to waters near the shore. A medium-sized *Masturus* would be too small to be readily noticed and to be taken with a harpoon. Then, again, is the probability that *Masturus* is commonly confused with and accepted as *Mola*. This might be particularly expected in fish of medium size, in which the caudal lobe probably is hardly so prominent as in larger specimens.

This hiatus in the series of *Masturus* tails is the more to be regretted because the preceding fine series of figures of post-larval tails will be followed by some equally good figures of tails of adults showing internal structure. It is most unfortunate that the structure of the in-between forms cannot be studied. The deficiency in my series is set out here in the hope that some reader may collect and send in these much wanted small specimens.

INTERNAL STRUCTURE OF THE TAIL IN ADULT *MASTURUS*.

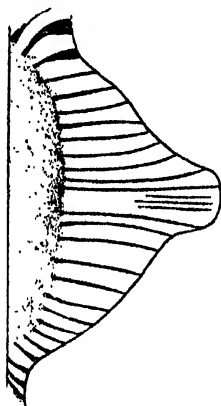
The morphology or general form and outline of the tail of an adult *Masturus* varies with every fish—in part due to the fact that an adult is rarely found with an un-mutilated caudal lobe. To study the external form is outside the purpose of this article. It will be dealt with in a general way later in an article on the natural history and distribution of the fish, wherein will be reproduced all published figures of adults and young. However, there are some available data bearing on the internal structure of the adult tail, and these will now be set forth.

The earliest Evidence.

There is evidence from four specimens caught long ago, which, taken in connection with what has been set forth from the study of the tails of post-larvæ, gives a clear indication of the internal structure of the adult tail.

Liénard's specimens, 1840-41.—The discoverer of *Masturus* dissected his larger specimen and states that the caudal had 19 rays. Unfortunately, not realizing the interest and value of counting separately the rays in the lobe, he does not give the number for it.

Fig. 22.



Internal structure of the caudal fin in a dried adult *Masturus* (31.5 in. long) from Amboina. Redrawn from Bleeker, 1873.

Bleeker's fish, 1873.—The second specimen ever figured gives some clue to the make-up of the tail of the adult *Masturus*. Bleeker had an alcoholic or more probably a dried specimen or skin from Amboina. His figure is a good one and shows well the blunt pointed tail—shaped here very much like the tail of a male crab—in which the fin-rays show up quite clearly (in fig. 22 herein). There are 7 rays above the lobe and 9 or 11 below. In the lobe and reaching back to the body are 2 rays in the upper part and 1 below (another just misses being in the lobe) and, what is of more interest, in between are 3 rays whose bases cannot be traced back to the body. Fig. 22 is an outline sketch of this tail

and lobe whose marked similarity to what has been figured for the young needs no further emphasis.

Collett's specimen, 1896.—Bleeker's unknowing hint of the peculiar structure of the caudal lobe of *Masturus* went unnoticed. However, in 1887, the Prince of Monaco captured in the North Atlantic west of the Azores an ocean sunfish (which he named *Mola mola*) with an unusual tail, which was preserved in salt. In 1896 Collett published a fine figure of the fish (fig. 1 herein) and dissected and described the structure of the caudal lobe. Of it he says :—"The tail in *Mola mola* is provided with twelve or thirteen rays which are widely separated from each other, and are relatively short, but in this specimen [i. e., *Masturus*] the two rays in the middle are separated into several long raylets, slender, about two and a half centimetres long, which continue to increase to form this peculiar prolongation." This he compares to what he had seen in Perugia's figure (my no. 12).

Collett did not know what a prize he had. He was obsessed with the idea that Perugia's fish was a baby *Mola mola* which would in time lose its filament and become round-tailed. He thought that this large fish was a *Mola mola* which had carried into adult life this curious remnant and development of the supposed larval tail—i. e., that it had an abnormal caudal fin. However, it was a *Masturus*, but its caudal lobe *was* abnormal—the lower part had evidently been bitten out by a shark (see fig. 1). That it was mutilated Collett never realized.

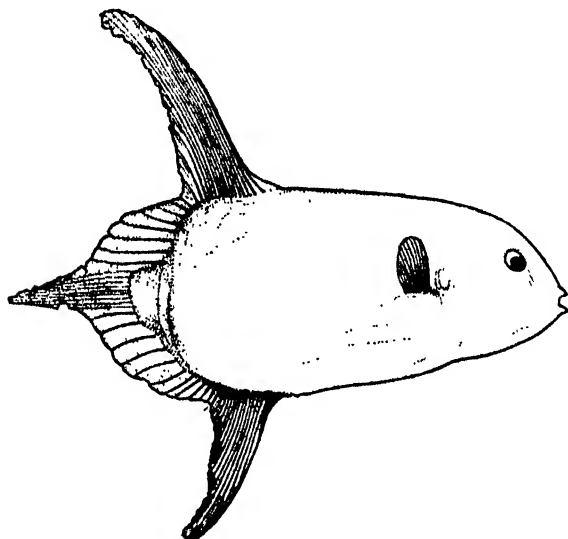
Klunzinger's Masturus.—About 1865 Klunzinger captured at Kosseir, near the head of the Red Sea, a pointed-tailed ocean sunfish which he thought to be a deformed *Mola mola*. This was deposited in the Berlin Museum where it now is. The history and a brief description of this specimen will be given in my forthcoming article on the history and distribution of *Masturus*. Here interest is concentrated on the structure of the tail. Through the courtesy of Dr. Paul Pappenheim, Director of the Museum, a photograph of the dried stuffed skin has been sent to me. In this the rays of the tail can be made out (in fig. 23). Careful count gives c. 7 rays above, 9 in lobe, and 11 below; a total of 27 caudal rays. Interesting is the blunt thick central part of the base of the caudal, from

which the rays of the lobe emerge to form a long point. These caudal lobe rays are distinctly slenderer than those above and below.

Recent Evidence from Florida Specimens.

Gudger and MacDonald (1935) in an extensive article on the occurrence of *Masturus* in Florida waters have set forth certain data on the internal structure of 4 adult tails.

Fig. 23.



Klunzinger's dried stuffed 65 in. specimen from the Red Sea, in the Berlin Museum. Drawn from a photograph sent by Prof. Paul Pappenheim.

St. Augustine, 1912.—They first report on the tail of a gigantic specimen (9 ft. in "over all" length) in the "Museum of Marine Curiosities" on Anastasia Island, St. Augustine. This great fish came ashore in 1912, and was mounted and put on display. The tail is very ragged, but fairly intact. Nothing could be made out in the small photograph, but by making a great enlargement the familiar structures were found—6 rays above and 7 below the lobe, and in the lobe 4 rays. Of these the 2 upper are close together, the 2 lower wide apart. Un-

fortunately this tail is in such shape as not to allow of a figure as do others now to be referred to.

The Daytona Fish, 1931.—Gudger and MacDonald figure in external aspect the curious malformed hooked caudal of this fish. They also present another figure of the tail after it had undergone two years' drying (Pl. II. fig. 24). This shows 2 rays and what is possibly the fragment of a third in the upper part of the lobe, while in the lower (hooked) part are 3 rays. In the centre of the lobe

Fig. 26.



External aspect of the fresh tail of an 84 in. *Masturus* from Miami, Florida. After Gudger and MacDonald, 1935.

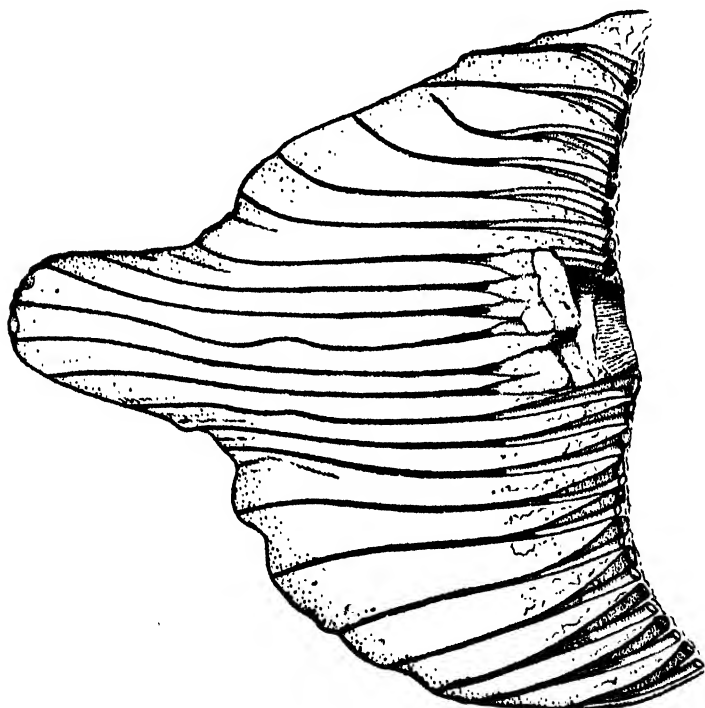
is a wide space from which apparently 2 or 3 or 4 median rays have fragmented and disappeared. This interesting figure throws a deal of light on the internal structure of this curious organ. The photographic figure is so clear that further description is not needed.

Miami Masturus no. 1, 1935.—Gudger and MacDonald also figure and describe (1935) a partly dried and maimed tail of a *Masturus* captured at Miami, Florida, early in January 1935. In this tail, which also hooks downward, as may be seen in Pl. II. fig. 25, 5 or 6 rays are visible. About 5 of these are in or near the centre of the lobe.

This structure ties up absolutely with those figured and described from post-larval and from other adult fishes.

Miami Masturus no. 4, 1935.—Last of all is the typical tail of another Miami *Masturus* also portrayed by Gudger and MacDonald (1935). Fig. 26 is from a photograph of the fresh tail—presented to the American Museum of Natural History by Mr. Albert Pflueger, naturalist and

Fig. 27.



Internal structure of the dissected tail shown intact in fig. 26.
Drawn from a 84 in. *Masturus* taken near Miami, Florida.

taxidermist of Miami, Florida. This figure shows the left side of the intact tail, presenting the details of the surface. Opposite this is fig. 27, in which the left side of this tail is dissected to show the fin-ray structure.

The fin-ray count is 7 rays above, 6 in the lobe, 9 below, and the total caudal rays number 22. Three rays are

slightly abnormal : no. 3 turns markedly upward instead of extending to the hinder edge of the fin ; nos. 10 and 13 show some small sinuosities. At the hinder edge of the lobe are two wart-like thickenings. The skin is tough, and under it is a dense collagenous material which dissects like so much rubber. This dissection was exceedingly difficult and was begun in the centre before I knew what to look for. Later it was found that each ray was embedded or enclosed in a little tunnel in this rubbery mass. The ray is slightly yellowish in colour, while the embedding mass is white. With these two things as guides, it was possible with care and patience to finish the task.

Some brief description and explanation of the hard structures of this tail may be given. Mr. Pflueger is endeavouring to secure and send to the American Museum a whole *Masturus* for complete dissection, illustration, and description. Such would be of very great value in helping to determine the position of *Masturus* in the Molidae and its relations to the other gymnodont fishes.

This tail was cut off too close to the fin to permit any study of the basals supporting the fin-rays. Each fin-ray is composed of a long rather stout cone of cartilage (drawn stippled). Well back towards the tip of each cone is attached the long slender bony or horny fin-ray (drawn striate) reaching to the edge of the fin. Extending from the body outward is a tendon on the outside of each ray and attached to the ray toward the end of the cartilaginous foundation part.

The central basal structures in line with the caudal lobe have been dissected out, and, pending better dissection on a whole fish, deserve brief description. The large striate body just above the median line of the fin is probably the floating vertebra so noticeable in figs. 18 and 19. While this seems to be at least partly bony in make-up, it is soft and easily penetrated by the finger nail. Behind this above and below is a bifurcate mass of pure cartilage. The upper piece gives rise to 2 single cones and 1 double cone to which are attached 4 fin-rays or spines. The lower segment gives rise to 2 cartilaginous ray bases. Such an abnormal structure as this is not unexpected in the tail of *Masturus*. I have seen a similar abnormality in a figure of the tail of *Mola*.

This imperfect dissection of an incomplete tail has resulted in a semi-diagrammatic drawing and a description that leaves much to be desired. Miss Hollister has stained some of the parts of this tail, and this has revealed some very unusual and interesting internal structures in these hard parts. This is not the place to take these up. The great desideratum is a medium-sized fish in good condition for a careful dissection for viscera, for muscles and skeleton. These, then, could be accurately figured and adequately described. In short, there is needed for *Masturus* just such a piece of work as Gregory and Raven * have recently done for *Mola*. Then, too, certain minute investigations (perhaps by sections) should be carried on. These studies, in connection with this on the structure and development of the tail, would surely help fix the position of *Masturus* in the Molidae and of the family in the division Gymnodontes of the suborder Plectognathi.

DOES *MASTURUS* USE ITS TAIL AS A
LOCOMOTOR ORGAN ?

This is a question which the reader has probably asked from time to time in his perusal of this article. However, none of the authors who have described young or old specimens of the fish have discussed locomotion in our fish. None of us has seen the fish in the water. But for all this certain well-founded conclusions may be drawn.

The larval form shown in fig. 2 (Pl. I.) has a stout tail like many other young teleosts. And like them it undoubtedly uses this tail to swim with. The post-larvæ portrayed in figs. 3-9 surely have no motility in the truncate tail-region. Some slight ability to use the tail-fin must be predicated of the little fishes shown in figs. 10 and 11. And of those illustrated in figs. 12, 16, or 17, there can be no doubt of the locomotor function of the tail.

Let us next pass to this question with regard to adults. Having studied with some care all the known figures of adults in the work on the distribution of the fish, I have come to the conclusion that the adult tail is used in locomotion. In this connection turn to Pl. I. fig. 1. The value of the tail in swimming depends to some extent

* Gregory, W. K., and Raven, H. C. (1924), "Notes on the Anatomy and Relationships of the Ocean Sunfish (*Mola mola*)," 'Copeia,' no. 4, 146-151, pl.

upon its non-mutilation—and the majority of those figured show plainly that at least the lobe has been mutilated. But when one studies the tail shown in figs. 26 and 27, with bony rays having stout cartilaginous bases and being provided with strong tendons, and particularly when one handles (and dissects) it, one is sure. The whole caudal fin is entirely flexible. This contrasts markedly with the very abbreviated and relatively very inflexible tail-fin parts of *Mola* and *Ranzania*, in which motility is reduced almost to zero.

WHAT IS THE POSITION OF *MASTURUS* IN THE FAMILY MOLIDÆ ?

In the present state of our knowledge this question can here and now be answered only in part. The larva of *Masturus* has a symmetrical fan-shaped primitive tail. The secondary tail, which is developed in the last stage of post-larval life, is an asymmetrical diphycceral tail. In my youngest fish, 32 (fig. 10) and 34 mm. long (fig. 11), there are fewer fin-rays above than below the lobe. This is true of all other young, and also of all adults (fig. 26). This results in an unsymmetrical diphycceral tail.

Mola has a bluntly rounded and faintly lobed caudal extremity. *Ranzania* (which I have never seen even in alcohol) has a tail cut off obliquely downward and forward—i. e., the dorsal end of it projects over the ventral part.

We have (thanks to various dissections) a very good knowledge of the anatomy of *Mola*. My work on *Masturus* has given fair knowledge of the make-up of the tail. Nothing is known of the structure of *Ranzania*, we have only its outer form and shape. Bringing together what little we do know, I suggest that *Masturus* is the most generalized form, *Ranzania* is the most specialized, with *Mola* in between.

BIBLIOGRAPHY.

- BLEEKER, PETER. 1873. "Description et Figure d'une Espèce Insulindienne d'*Orthogoriscus* [*lanceolatus*]." Versl. K. Akad. Wet. Amsterdam, 2, ser. vii. pp. 151-153, fig.
COLLETT, ROBERT. 1896. "Poissons provenant des Campagnes du Yacht l'*Hirondelle* (1885-1888)." Résultats Campagnes Sci . . . par Albert I. . . de Monaco, Fasc. 10 (*Mola mola* [*Masturus lanceolatus*], pp. 163-169, pl. vi. fig. 1).

- GATCHET, H. 1832. "Note sur l'*Orthogoriscus spinosus* Bl. Schn. [*Masturus lanceolatus*]." Actes Linn. Soc. Bordeaux, v. pp. 253-262.
- GILL, THEODORE. 1884. "Synopsis of the Plectognath Fishes." Proc. U.S. Nat. Mus. vii. (Molacanthidae, pp. 426-427).
- GUDGER, E. W. 1935. "Some undescribed Young of the Pointed-tailed Ocean Sunfish, *Masturus lanceolatus*." 'Copeia,' no. 1, pp. 35-38, 2 figs.
- , & MACDONALD, S. R. 1935. "The Rarest of the Ocean Sunfishes [*Masturus lanceolatus* in Florida Waters]." 'Scientific Monthly,' xli. pp. 396-406, 15 figs.
- GÜNTHER, A. C. L. 1880. "An Introduction to the Study of Fishes." ("Young of *Orthogoriscus* [*Masturus*]," p. 175, fig. 94.) Edinburgh.
- KLUNZINGER, C. B. 1871. "Synopsis der Fische des Rothen Meeres.—II. Theil." Ver. zool.-botan. Ges. Wien, xxi. (*Orthogoriscus mola* = *Masturus lanceolatus*, p. 648).
- LIÉNARD, ELIZÉ. 1840. "Description d'une nouvelle Espèce du Genre Mole (*Orthogoriscus* Schn. [*Masturus*]). Découverte à l'Île Maurice." Revue Zool. Paris, pp. 291-292.
- , 1841. "Description d'une nouvelle Espèce du Genre Mole (*Orthogoriscus* Schn.). Découverte à l'Île Maurice et nommée *Orthogoriscus* [*Masturus*] *lanceolatus*." Mag. Zool. 2, ser. iii. (Poissons, pl. iv.).
- MCCULLOCH, A. R. 1912. "A Description and Figures of Three Specimens of *Molacanthus* [*Masturus*] from the Central Pacific Ocean." Proc. Linn. Soc. N.S. Wales, xxxvii. pp. 553-555, 2 pls.
- PERUGIA, ALBERTO. 1889. "Sui giovani dell' *Orthogoriscus mola* [*Masturus lanceolatus*]." Ann. Mus. Civ. Stor. Nat. Genova, xxvii. pp. 365-368, fig.
- PUTNAM, F. W. 1871. "On the Young of *Orthogoriscus mola* [*Masturus lanceolatus*]." Proc. Amer. Soc. Adv. Sci. for 1870, 19 meet., pp. 255-260, 4 figs. Amer. Naturalist, 1871, iv. pp. 629-633, 4 figs.
- RYDER, J. A. 1886. "On the Origin of Heterocercy and the Evolution of the Fins and Fin-rays of Fishes.—IX. On the Transformations of the Tail of *Mola* [and *Masturus*]." Rept. U.S. Comm. Fish. and Fisheries for 1884, pp. 1027-1040, pl. viii.
- SCHMIDT, JOHANNES. 1921 (1). "Contributions to the Knowledge of the Young of the Sunfishes (*Mola* and *Ranzania* [and *Masturus*])." Meddel. Komm. Havunders. Ser. Fiskeri, Bd. vi. 16 pp., pl., 15 text-figs.
- , 1921 (2). "New Studies of Sunfishes made during the 'Dana' Expedition, 1920." 'Nature,' cvii. pp. 76-79, 6 text-figs.
- , 1926. "Further Studies of Sunfishes made during the 'Dana' Expedition, 1921-1922." 'Nature,' cxvii. pp. 80-81, 2 text-figs.
- , 1932. 'Dana's Togt omkring Jorden, 1928-1930' ("Young Ocean Sunfishes, including *Masturus*" (pl. clxvii.). Copenhagen.
- STEENSTRUP, J., & LÜTKEN, CHR. 1898. "Spolia Atlantica. Bidrag til Kunskaab om Klump-eller Maanefiskene (Molidæ)." K. Danske Vidensk. Selsk. Skrifter. 6, ser. ix. (*Ranzania truncata* [*Masturus lanceolatus*], pp. 51-54, Tab. IV., figs. C, D, and E).

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. *Masturus lanceolatus* taken by the Prince of Monaco in 1887 in the North Atlantic west of the Azores. The lower half of the caudal lobe is gone—probably bitten out by a shark or a barracuda. After Collett, 1896.

Fig. 2. A 2.8 mm. larval *Masturus*—the smallest on record. Note the paddle-shaped tail-fin. After Schmidt, 1921 (1); 1932.

Fig. 3. The smallest (5 mm.) post-larval *Masturus* ever figured. Note the reduced tail and the long spines. After Schmidt, 1921 (1); 1932.

PLATE II.

Fig. 5. A 10.5 mm. *Masturus* from the Sargasso Sea. Note the remnant of the tail and the centripetally proliferating caudal rays. After Schmidt, 1932.

Fig. 24. Dried tail of a 100 in. adult *Masturus* taken at Daytona, Florida. After Gudger and MacDonald, 1935.

Fig. 25. A dried tail of a 47 in. specimen captured near Miami, Florida. After Gudger and MacDonald, 1935.

II.—On *Leptolepis bronni* Agassiz. By DOROTHY H. RAYNER, University College, London.

INTRODUCTION.

The material of this paper represents the initial stage in a study of the Mesozoic Ganoids in which it is intended to concentrate especially on the neurocrania.

*Leptolepis bronni** is abundant in the Upper Lias, and may have occurred in the Lower Lias also. Other species of *Leptolepis* continue through the Jurassic and up into the Cretaceous. Specimens of similar fish from the Lower Lias have usually been classed as *Pholidophorus*, which is certainly closely allied. It is hoped that future work may show to what extent these may be regarded as the forerunners of *Leptolepis*, or even as belonging to that genus. A very interesting specimen in Professor D. M. S. Watson's collection from the Trias of Seefeld, Austria, shows a very *Leptolepid*-like appearance, but has not yet been examined in any detail. It may be, therefore, that the downward range of the genus will have to be considerably extended.

The fish examined were for the most part embedded in a soft compact limestone and were excellently preserved,

* In a recent paper Arambourg (1935) has preferred the species name *coryphænoides* to *bronni* on the grounds of priority; in the present work the writer is not primarily concerned with systematic description, and has followed Smith Woodward (1895) in retaining the latter. Readers are also referred to Smith Woodward for a synonymy of the species.

in some cases almost uncrushed; they are found in the Fish-bed of the Upper Lias (*falcifer* and *exiratum* zones), and have been collected from Ilminster, Dumbleton, and Cury (Normandy). The description and figures are compiled from many specimens.

The majority of specimens are from the British Museum (Natural History); the writer wishes to thank Dr. E. I. White for the loan of these, and for the opportunity to examine many others in the Museum collection. She is also indebted to Mr. J. R. Norman for permission to examine the skull of *Osteoglossum* described by Bridge. The remainder of the material is in the possession of Professor D. M. S. Watson, to whom especial thanks are due for much help and encouragement throughout the work, and also for reading through this manuscript. Finally, the writer gratefully acknowledges a Harkness Scholarship from the University of Cambridge.

DESCRIPTION.

Small slender fish, 10 cm. or slightly under in length, of which 1·8 to 2 cm. is occupied by the head. The pelvic fins arise opposite the dorsal and are considerably nearer the anal than the pectoral fin. The bones have a very thin covering of ganoin, and lack any regular ornamentation except for the cleithrum. The scales are cycloid, and are covered by a similar thin bony layer.

Roof of the Skull.

The frontals are the largest bones in the skull-roof; anteriorly they are narrow strips of bone with parallel sides, but broaden behind, where their bounding sutures become sinuous and often vary considerably in different individuals. They carry the hind part of the supra-orbital lateral line canal, which, instead of joining up with the main canal of the body across the temporal region, continues backward to cross the junction with the parietal, and terminates near the margin of that bone. A few small branches may arise from the inner side of the canal in the posterior part of the frontal, i. e., pass obliquely backward, but these are not a constant feature.

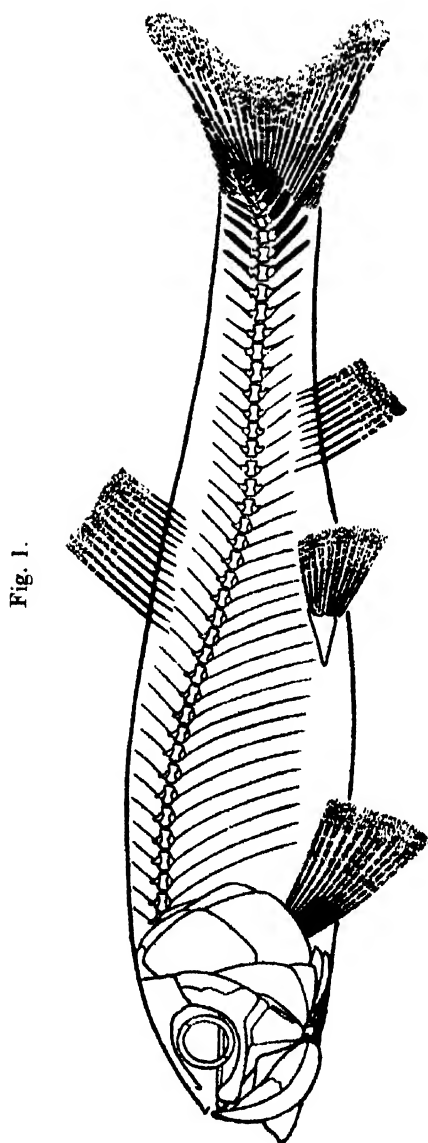


Fig. 1.

Restoration of *Leptolepis bronni*, scales omitted. $\times 1\frac{1}{2}$.

This arrangement of sensory canals in *Leptolepis* is the normal condition in Palæoniscids. Its importance will be discussed later.

On either side of the frontals, above the eye, lie two narrow supraorbital bones, of which the anterior is considerably the longer.

The parietals are more or less square, with irregular margins. In addition to the small portion of supraorbital canal already mentioned they bear the anterior and median pit-lines. The former continues the line of the sensory canal; the latter lies across its path at the hind end, extending both laterally and medially. There is no constant indication that the posterior pit-line was present, though the bone is usually irregularly corrugated in this region.

There is a pair of single supratemporo-intertemporal bones lying on either side of the parietals, with a narrow anterior prolongation bordering the frontals. The infraorbital canal lies close to the lateral margin and has a short branch to the posterior corner connecting it with the preopercular canal. It passes on to the extrascapular behind and the dermosphenotic in front.

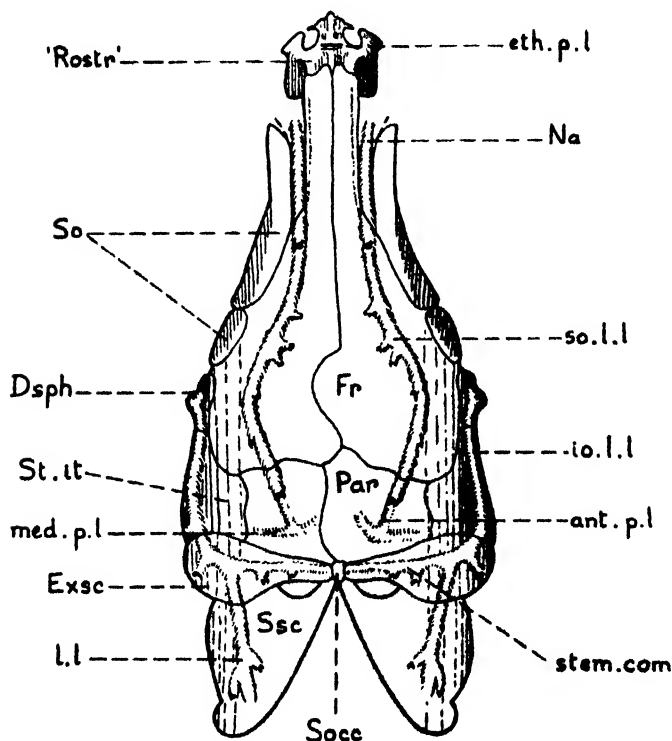
The latter is a small bone, scarcely larger than the canal it bears; this is roughly Y-shaped, being the point where the infraorbital canal turns downward to run behind the eye, together with a small branch passing upwards and forwards from the junction.

The extrascapulars carry the supratemporal cross commissure, which enters near the lateral margin. It gives off about four short branches on the posterior side, the second being actually the most anterior section of the main canal of the body which is continued on the suprascapular. This is a wing-shaped bone, only loosely attached to the remainder of the skull, and will be considered with the pectoral girdle.

The roofing bones of the snout are less easy to interpret than those already described. A stout unpaired bone lies anteriorly to the frontals, in shape and position similar to the mesethmoid of various writers on Teleosts. A narrow process extends laterally on either side of the anterior point, while further back are larger flattened processes which bend downward and backward to form part of the floor of the nasal capsule. A thin extension

also directly underlies the frontals, and there are traces of a median septum. It has all the appearance of a membrane bone, and the upper surface bears a transverse groove, sometimes almost amounting to a closed

Fig. 2.



Roof of the skull, $\times 6.6$. *Ant.p.l.*, anterior pit-line; *Dsph*, dermosphenotic; *eth.p.l.*, ethmoid pit-line; *Exsc*, extrascapular; *Fr*, frontal; *io.l.l.*, infraorbital lateral line canal; *l.l.*, cephalic division of main lateral line canal; *med.p.l.*, median pit-line; *Na*, nasal; *Par*, parietal; 'Rostr.', "rostral" bone; *So*, supraorbital; *so.l.l.*, supraorbital lateral line canal; *Socc*, supraoccipital; *St.it.*, supratemporo-intertemporal; *stem.com*, supratemporal commissure; *Ssc*, suprascapular.

canal, which almost certainly represents the ethmoid cross commissure. Since there is very little definite information, however, as to this region in other Holostean groups

no attempt will be made to discuss its possible homologies here. There is no sign of any separate vomer, but it may well have been fused to the ventral part of this rostral bone.

The posterior portion of the nasals can be seen lying on either side of the frontals, partially separating them from the anterior supraorbital. They bear the continuation of the supraorbital canal, and in this region consist of little more than this bony tube. Anteriorly they can be seen to widen, but here the bone is always incomplete, being crushed on the stouter elements beneath. In consequence the relations of the supraorbital to intraorbital canal and also to the ethmoid commissure is unknown. It seems probable, however, that the dermal bony covering was always incomplete around the nasal aperture, as it is in the primitive Teleosts.

Cheek Bones.

The premaxilla is a curved slip of bone meeting its fellow in the mid-line. It has an upward enlargement abutting on the small lateral process of the rostral bone, but no underlying projection connected with the neurocranium. The outer margin bears about twelve fine teeth.

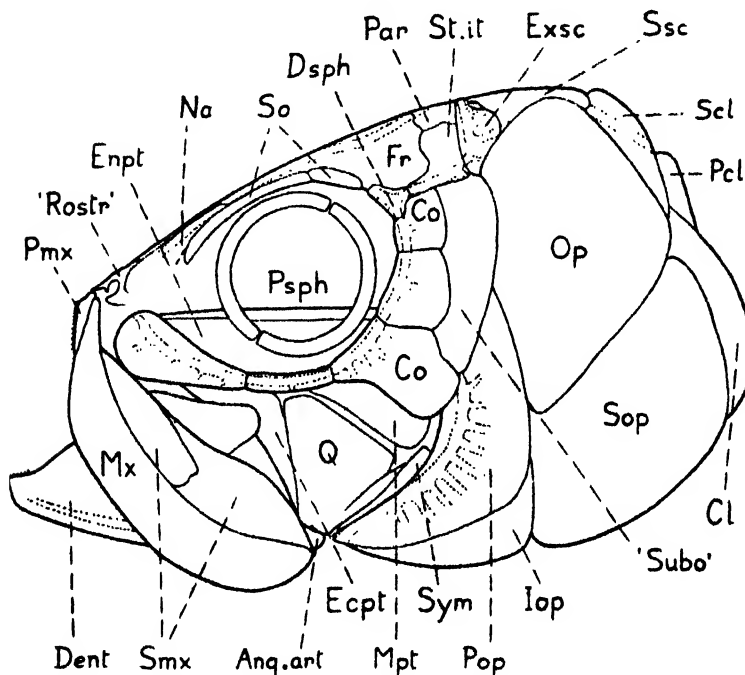
The maxilla has a thick anterior elongation lying above and behind the premaxilla, and apparently also meets the same bone of other side. More posteriorly it broadens into a wider curved plate with a thickened ridge near the dorsal margin; above this ridge the bone is overlapped by the two supramaxillaries. The ventral edge is provided with minute thickenings that project slightly, producing a faintly indented margin.

The two supramaxillaries are about equal in size; the posterior is drawn out to a fine point in front which borders the anterior dorsally for some distance. It is irregularly thickened with a central groove that probably represents the horizontal pit-line of the cheek (see Westoll, 1937).

Behind and below the eye lie five circumorbitals, carrying the anterior continuation of the infraorbital canal from where it leaves the dermosphenotic. The three behind the eye are roughly quadrangular; then follows a narrow bone, only a little wider than the canal,

while the most anterior is also elongated, but broader in front, where the margin is rounded. The series bear a varying number of branches of the sensory canal, directed away from the orbit. Behind the posterior circumorbitals is an elongated triangular "suborbital."

Fig. 3.



Side view of skull, $\times 5$. *Ang.art*, angulo-articular; *Cl*, cleithrum; *Co*, circumorbital; *Dent*, dentary; *Dsph*, dermosphenotic; *Ecpt*, ectopterygoid; *Enpt*, entopterygoid; *Exsc*, extrascapular; *Fr*, frontal; *Iop*, interopercular; *Mpt*, metapterygoid; *Mx*, maxilla; *Na*, nasal; *Op*, opercular; *Par*, parietal; *Pcl*, postcleithrum; *Pmx*, premaxilla; *Pop*, preopercular; *Psph*, parasphenoid; *Q*, quadrato; *'Rostr'*, "rostral" bone; *Scl*, supraclathrum; *Smx*, supramaxilla; *So*, supraorbital; *Sop*, subopercular; *Ssc*, suprascapular; *St.it*, supratemporo-intertemporal; *'Subo'*, "suborbital"; *Sym*, symplectic.

The remaining cheek-bones comprise the opercular and pre-, sub-, and interopercular bones. The preopercular is crescent-shaped, though when in place it is

somewhat overlapped by the "suborbital." The preopercular canal runs near the front margin and gives off a large number of radiating branches posteriorly; these vary in different individuals from about nine to eight en.

The opercular is a large bone, rounded above and slightly overlapping the suprascapular. The anterior margin is thickened and bears a small indentation as facet for the hyomandibular. The opercular is truncated obliquely at the ventral edge, the margin slanting downward and forward to meet the anterior border at an angle of about 50° .

The subopercular is somewhat smaller and broadly rounded behind and below. The interopercular is a triangular bone lying below, and considerably overlapped by the preopercular.

Lower Jaw.

This is composed of two elements only—dentary and angulo-articular. The former has the characteristic

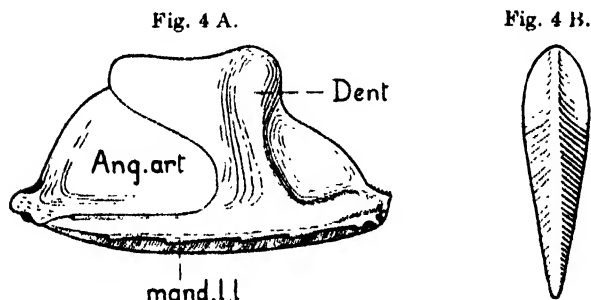


Fig. 4 A.—Right lower jaw, external view. $\times 5$. *Ang.art*, angulo-articular; *Dent*, dentary; *mand.l.l.*, mandibular lateral line canal.
Fig. 4 B.—Gular, ventral view. $\times 10$.

high coronoid process of the Leptolepidæ, but curiously thickened in a vertical band only, so that a delicate wing protrudes backwards, and another thin portion stretches between this band and the anterior point of the jaw. The main shaft of the bone carries the mandibular canal on its outer surface, in such a way that it runs in a raised ledge, narrower than the inner surface of the shaft, which protrudes below as a long thin flange. Teeth are borne

on a short distance only of the upper margin ; about six have been observed, resembling those on the pre-maxilla.

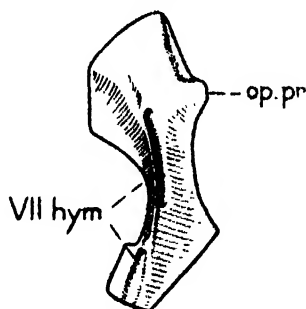
The angulo-articular is for the most part a thin triangular sheet filling in the space behind the coronoid process. It becomes thicker at its posterior angle, where it articulates with the quadrate. Just below this articulation the mandibular canal runs through the bone for a short distance before entering the dentary. It is well sunk below the roughened surface, and the entrance hidden from the external view by an overhanging flap.

A small and delicate gular plate has been found in two specimens in which the mandibular and hyoid arches are seen from below (P. 940 and 3240, Brit. Mus. Nat. Hist.). It lies between the anterior halves of the lower jaw and is spatulate in shape with a median ridge.

Hyoid Arch.

The hyomandibular has a roughly vertical position ; at its upper end there is a thick rounded head for articulation with the neurocranium. On either side of the

Fig. 5.



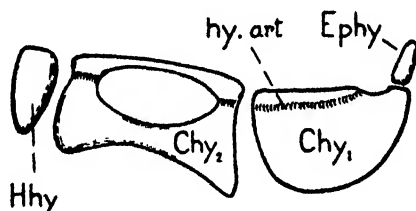
Left hyomandibular, external view. $\times 5$. *op. pr.*, opercular process ; *VII hym*, passage for hyomandibular branch of facial nerve.

articulating surface are thin wings of bone, the posterior of which stretches across to a small opercular process. A sharp median ridge runs down the main shaft of bone, dying away at the lower end. The bone is again thickened in this region for articulation with the symplectic and epihyal. The hyomandibular nerve pierces the inner

surface of the bone near the anterior corner of the upper articulating process; it emerges on the outer surface behind the median ridge just below the level of the opercular process. From this point it runs downward to pierce the median ridge again near the lower end, and continues in a well-marked groove on the external surface until it passes off the ventral margin.

The symplectic is an elongated bone, narrowing to a point beside the articulating facet of the quadrate. A depression in the outer surface near the upper end leads into several small passages in the bone, but since no openings are visible on the other side they must serve the interior of the symplectic only. From their position they possibly transmitted branches of the internal mandibular branch of the facialis nerve.

Fig. 6.



Left hyoid arch, external view. $\times 5$. *Chy₁*, proximal ossification of ceratohyal; *Chy₂*, distal ossification of ceratohyal; *Ephy*, epihyal; *Hhy*, hypohyal; *hy.art*, groove for the hyoidean artery.

Between the approaching ends of the hyomandibular, symplectic, and epihyal there is a considerable cartilage interspace. The epihyal in the fossil state lies in the same plane as the other two, but in life must have been directed downwards and inwards from its articulation with them.

The remaining parts of the hyoid arch were only seen in one specimen where the visceral arches were crushed flat from beneath (B.M.N.H., P. 940). The proximal bone of the ceratohyal is roughly semicircular, the flat margin directed upwards and somewhat outwards. The distal section is hourglass-shaped, with a narrow connecting rod between anterior and posterior corners on the upper side. The course of the hyoid artery is marked by a large groove on the outer side of the arch. It first

appears on the proximal bone entering the upper margin near the hind end, and continuing forward close to that margin. It is continued across the distal bone, where two grooves traverse either end of the dorsal connecting splint. A small hypohyal, stout and triangular, completes the arch.

Several flattened branchiostegal rays are attached to the ventral margins of the two ceratohyal bones, but their exact number is unknown. The hind members of the series, those protruding from below the interopercular, are especially broad.

Other remnants of cartilage bone indicate that the remaining branchial arches were probably ossified to some extent, but nothing definite can be given regarding their shape and position. Similarly portions of a long median urohyal have been seen, but it is unknown in any detail.

Palate.

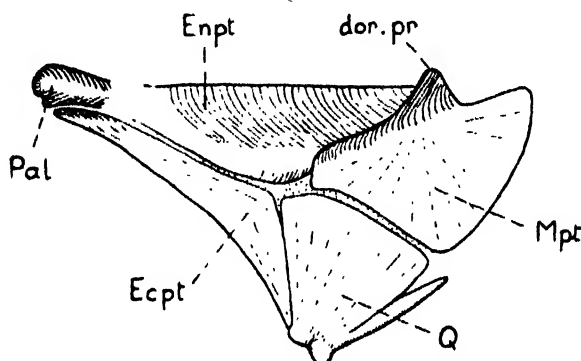
The quadrate is of the usual fan shape, with a narrow splint-like projection arising from the articulating process and overlying the symplectic. The ectopterygoid is long, thin, and curved, tapering to a point at each end. The entopterygoid is also thin; dorsally it borders the parasphenoid, and in shape is long and curved, with the concave surface facing upwards and slightly outwards. Forming as it does the roof of the mouth it is at a broad angle with the more lateral parts of the palate. Posteriorly it is covered by the metapterygoid, and has a dorsal process closely applied to a similar one arising from that bone; the main body of the entopterygoid continues posteriorly for a short way behind this, till cut off squarely by the hind border.

The palatine bone is attached to the front end of the entopterygoid. It is a small single ossification, rounded and slightly flattened laterally.

The metapterygoid may conveniently be divided into two portions; the larger is a semicircular wing lying in the same plane as the ectopterygoid and quadrate, placed dorsally to the latter. The rounded borders and slight space left between these two show that some cartilage persisted here into the adult. From the upper straight edge of this wing the dorsal process arises;

it is directed inward and slightly upward, and, together with that of the entopterygoid, it forms an arch over the main body of the latter and articulates with the basiptyergoid process of the parasphenoid. (This last will be described with the neurocranium.) At the posterior angle at the base of the dorsal process several small and narrow arches of bone connect the two portions on their inner sides.

Fig. 7.



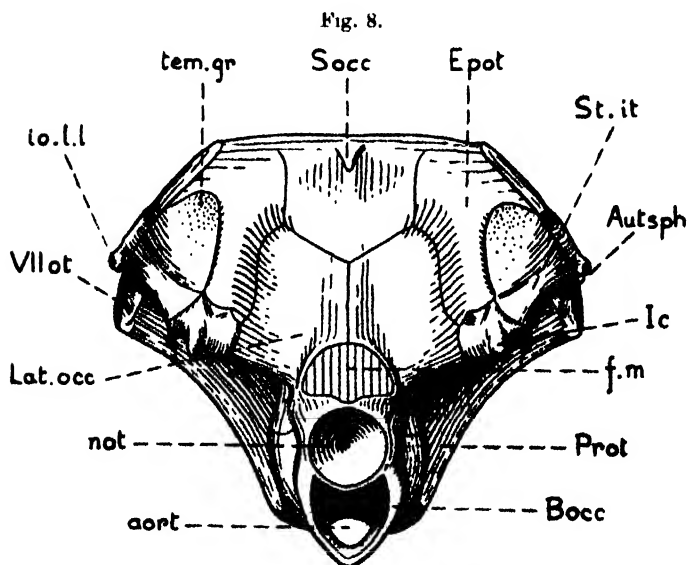
Left side of palate. $\times 6.6$. *dor.pr*, dorsal process of metapterygoid; *Ecpt*, ectopterygoid; *Enpt*, entopterygoid; *Mpt*, metapterygoid; *Q*, quadrate; *Pal*, palatine.

External Features of Neurocranium.

The postorbital part of the neurocranium has been studied in several uncrushed skulls, but in most the thoroughness of the ossification has obscured the sutures between the bones. These are well seen, however, in two specimens, one slightly immature and another where the bones of the orbital surface have been pushed forward out of position (*i. e.*, Prof. Watson Coll. P. 507, and B.M.N.H. 32462 respectively). The roof of the brain-case must have consisted of cartilage or membrane only, covered by the dermal bones.

The basioccipital forms the notochord pit, ventral canal for the dorsal aorta, and more anteriorly enlarges to surround the saccular region of the otic capsule. The lateral walls of the aortic canal are very delicate; they are pierced by two efferent arterial foramina near the ventral margin, and another artery emerges dorsally.

The sutures between this bone and the lateral occipitals cannot be seen very clearly, but it is possible that the latter extended down some way each side of the notochord pit on the external surface. They undoubtedly border the foramen magnum and meet for some distance above it, forming a very gentle median vertical ridge. On the side of the skull they continue the hind wall of the otic



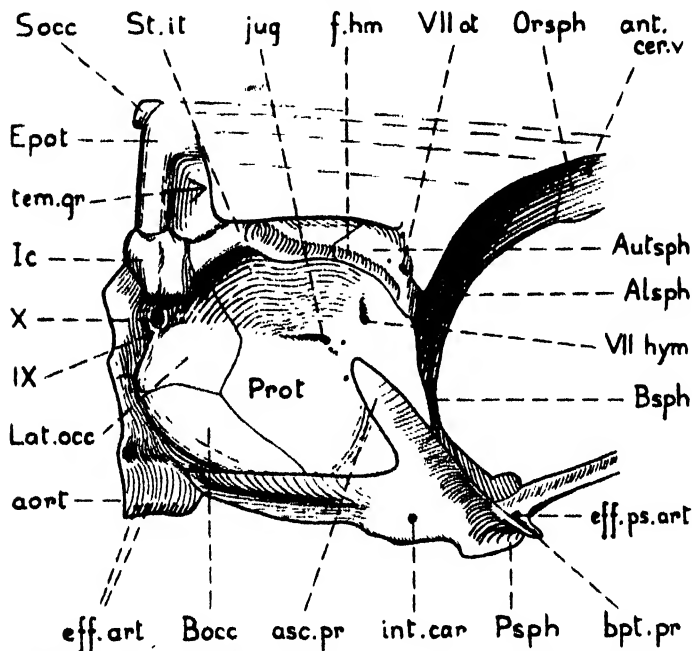
Hind view of neurocranium. $\times 10$. *aort*, canal for dorsal aorta; *Aut sph*, autosphenotic; *Bocc*, basioccipital; *Epot*, epiotic; *f.m*, foramen magnum; *Ic*, intercalar; *io.l.l*, infraorbital lateral line canal; *Lat.occ*, lateral occipital; *not*, notochord pit; *Prot*, prootic; *Socc*, supraoccipital; *St.it*, supratemporo-intertemporal; *tem.gr*, temporal groove; *VII ot*, foramen for otic branch of facial nerve.

capsule above the basioccipital. The tenth nerve emerged through a large opening at the hind margin of the capsule, and a smaller one for the ninth lies a little in front of it.

The supraoccipital has only a slight median crest projecting backwards. The epiotics on either side stand out as two rounded vertical elevations. At their ventral ends they meet a similar pillar of the supratemporo-intertemporal, inclined forward and upward from this

point. The junction of the two bones is capped by a small irregular intercalar; between them lies a considerable pit continuing inwards below the dermal roof beyond the limits of ossification. It is the temporal

Fig. 9.



Lateral view of neurocranium, right side. $\times 10$. *Alsph*, alisphenoid; *ant.cer.v*, foramen for anterior cerebral vein; *aort*, canal for dorsal aorta; *asc.pr*, ascending process of parasphenoid; *Autsph*, auto-sphenotic; *Bocc*, basioccipital; *bpt.pr*, basipterygoid process of parasphenoid; *Bsph*, basisphenoid; *eff.art*, foramina for efferent branchial arteries; *eff.ps.art*, foramen for efferent pseudobranchial artery; *Epot*, epiotic; *f.hm*, facet for hyomandibular; *Ic*, intercalar; *int.car*, foramen for the internal carotid artery; *jug*, jugular canal; *Lat.occ*, lateral occipital; *Orsph*, orbitosphenoid; *Prot*, prootic; *Psph*, parasphenoid; *Socc*, supraoccipital; *st.it*, supratemporo-intertemporal; *tem.gr*, temporal groove; *VII hym*, foramen for hyomandibular branch of facial nerve; *VII ot*, foramen for VII branch of facial nerve; *IX*, foramen for glossopharyngeal nerve; *X*, foramen for vagus nerve.

groove of the Teleosts, and served for the attachment of trunk muscles.

The prootic is the largest bone forming the lateral wall of the brain-case and otic capsule; on the outside

it bears three important foramina. The jugular canal arises a little in front of the centre of the bone, and continues backwards as a slight horizontal hollow. It is convergent in front with a short upward passage for the hyomandibular nerve and a downward one for the facial branch. The course of the latter is continued to the edge of the bone by a distinct groove.

The autosphenotic bears the anterior part of the hyomandibular facet, the posterior portion being a narrow ledge of the supratemporo-intertemporal. Above this facet the upper face of the bone partly underlies the dermosphenotic; where it is exposed it carries a rather large foramen for the otic nerve and at least one smaller one for a secondary branch of this nerve.

The orbital surface of the neurocranium is smoothly curved, though much interrupted ventrally by the openings of the myodome and trigemino-facial chamber. The two orbits are largely confluent, and there is a very large optic foramen in the front wall of the brain-case.

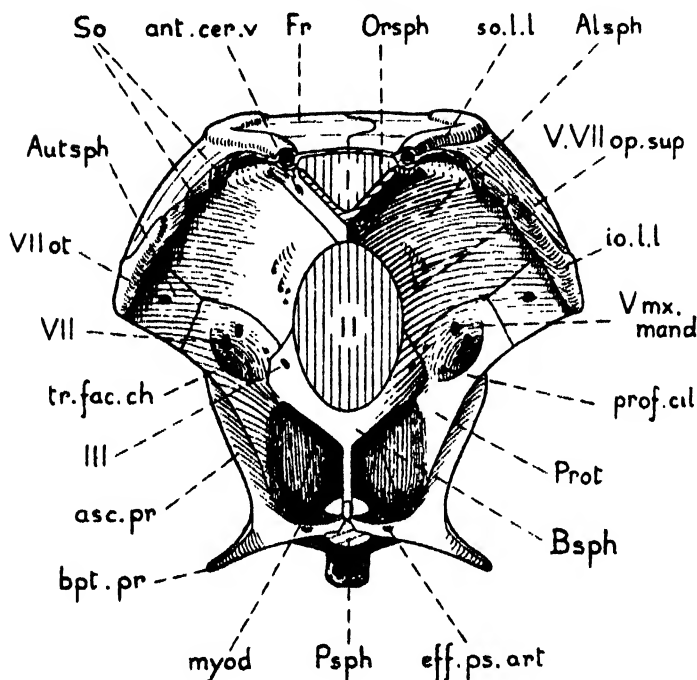
On this face the prootic appears as a narrow rim surrounding the trigemino-facial chamber, together with a thin edge of bone which forms the outer wall of the myodome. Above it there lies the quadrangular face of the autosphenotic, pierced by the otic nerve, whose emergence on the lateral wall has already been described. The alisphenoid continues the curve medially and forwards; it is entirely separated from its fellow on the other side by the optic foramen. Still further forward the orbitosphenoid closes this opening and forms a V-shaped ventral covering to the olfactory nerves. The lower margin of the optic foramen is formed by the basisphenoid; this is a Y-shaped bone with two broad wings stretching upwards and backwards and a very thin stem which enlarges slightly where it rests on the parasphenoid.

The alisphenoid bears two small foramina near its orbital margin; they lead upwards into a single shallow groove and represent the trigeminus and facialis branches of the ophthalmicus superficialis. Their appearance here separated from the main trunks of these nerves shows that the trigemino-facial ganglionic complex must have lain at least in part inside the cranial cavity.

The trigemino-facial chamber has three major openings on its inner wall. The largest lies furthest back about

on a level with the centre of the chamber ; from it issued the hyomandibular trunk, passing somewhat downwards from the cranial cavity ; it then curled backwards

Fig. 10.



Neurocranium cut through slightly in front of optic foramen and viewed from in front. $\times 10$. *Alsph*, alisphenoid ; *ant.cer.v*, foramen for anterior cerebral vein ; *asc.pr*, ascending process of parasphenoid ; *Autsph*, autosphenotic ; *bpt.pr*, basipterygoid process of parasphenoid ; *Bsph*, basisphenoid ; *eff.ps.art*, foramen for efferent pseudobranchial artery ; *Fr*, frontal ; *io.l.l*, infraorbital lateral line canal ; *myod*, myodome ; *Orsph*, orbitosphenoid ; *Prot*, prototic ; *Psph*, parasphenoid ; *So*, supraorbital ; *so.l.l*, supraorbital lateral line canal ; *tr.fac.ch*, trigemino-facial chamber ; *I*, olfactory canal ; *II*, optic foramen ; *III*, foramen for oculomotor nerve ; *V mx.mand*, foramen for maxillary and mandibular branches of trigeminal nerve ; *V.VII op.sup*, foramina for the superficial ophthalmic branches of trigeminal and facial nerves ; *prof.cil*, foramen for the profundus and ciliaris nerve-trunk ; *VII*, foramen for the facial nerve ; *VII ot*, foramen for otic branch of the facial nerve.

and downwards to enter the jugular canal. The trigeminus issued forwards through the next opening, which lies on a slightly higher level ; it passed directly into the

orbit. There remains a third aperture lying ventrally to the other two through which the trunk of the profundus and ciliaris nerves probably ran forward from the brain to enter the eyeball. Another small foramen pierces this face of the prootic just above and median to the trigemino-facial chamber. It has no obvious connection with any nerve, and probably transmitted a blood-vessel. There are many such small foramina in the neurocranium whose position varies considerably in different specimens; these were either nutritive or served for the passage of small neural branches whose origin is not determinable.

The oculomotor nerve emerged through a fairly large opening in the wing of the basisphenoid; the trochlearis probably entered through the optic foramen. Near the upper hind corner of the orbitosphenoid is a passage leading inwards and forwards carrying the anterior cerebral vein.

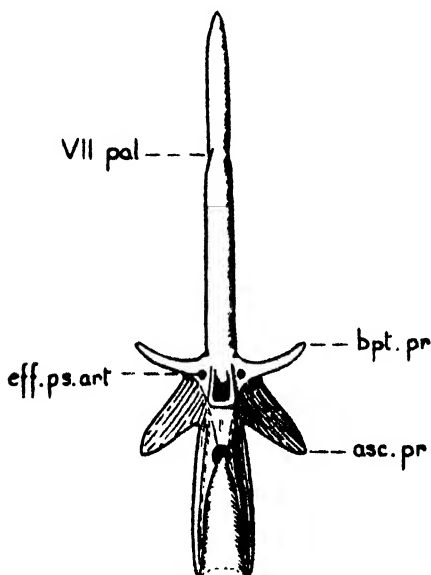
The ventral edges of prootic and basioccipital in front of the aortic canal are covered by the parasphenoid. Here this consists of two long vertical wings connected near the upper margin by a thin horizontal sheet of bone, which thus forms the floor of the myodome. Its extension backwards is unknown, so it is uncertain whether or not the myodome was in communication with the aortic canal.

The internal carotids arose from the dorsal aorta in front of this canal, and, passing forwards and upwards, pierced the base of the ascending process. From their emergence on the inner side they crossed under the muscles and nerves issuing from the myodome, turned upward on either side of the basisphenoid, and probably entered the cranium through the optic foramen. The ascending process clearly covered the exit of the facial nerve, which on reaching the edge of the prootic turned forwards along the dorsal surface of the parasphenoid; opposite the front margin of the orbit an interruption in the lateral flange of this bone shows that the nerve passed to the ventral side.

The parasphenoid also bears an anterior, basipterygoid process; this arises close in front of the ascending wing and lies in an almost horizontal plane, directed outwards and somewhat forwards. It has an anterior groove for

articulation with the meta- and entopterygoid. At the base of this process is a foramen which must have accommodated the efferent pseudobranchial artery, piercing the parasphenoid from below. In some Teleosts there is a transverse commissure between these two vessels before they turn upwards and outwards as the ophthalmic arteries. Such an anastomosis is recorded in the Kansas

Fig. 11.



Parasphenoid, ventral view. $\times 6.6$. *asc.pr*, ascending process; *bpt.pr*, basipterygoid process; *eff.ps.art*, foramen for efferent pseudobranchial artery; *VII pal*, notch for the palatine branch of the facial nerve.

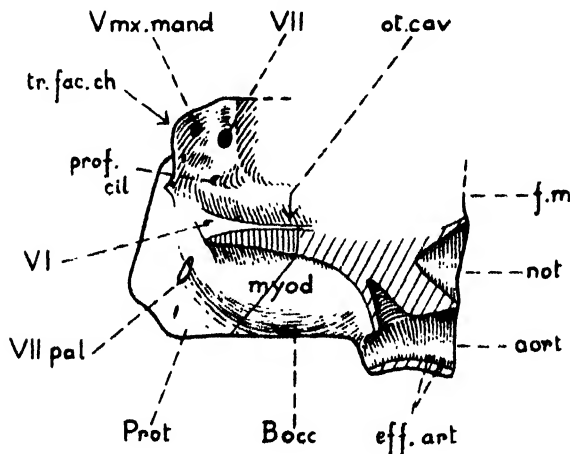
Palæoniscid B (Watson, 1925), but there is nothing to show whether one was present in *Leptolepis* or not.

On the lower surface of the parasphenoid the two posterior wings meet slightly behind the carotid foramen to form a short tunnel; this is blind in front, however, and has no connection with a short wide trough that is found a little further forward just behind the basipterygoid processes.

Myodome and Cranial Cavity.

The myodome is a long unpaired cavity enclosed by the prootics, basi- and parasphenoid. The narrow stem of the basisphenoid separates its two orbital openings. In front the roof of the cavity is interrupted by the infundibular fenestra; further back the median horizontal processes of the prootic meet to form a flat plate gradually narrowing posteriorly as the side-walls approach one

Fig. 12.



Prootic and basioccipital cut along the mid-line, and viewed from the median side. $\times 10$. *aort*, canal for dorsal aorta; *Bocc*, basioccipital; *eff.art*, foramina for efferent branchial arteries; *f.m*, foramen magnum; *myod*, myodome; *not*, notochord pit; *ot.cav*, otic cavity; *Prot*, prootic; *tr.fac.ch*, trigemino-facial chamber; *Vmx.mand*, foramen for the maxillary and mandibular branches of the trigeminal nerve; *prof.cil*, foramen for the profundus and ciliaris nerve-trunk; *VI*, foramen for abducens nerve; *VII*, foramen for facial nerve; *VII pal*, foramen for the palatine branch of the facial nerve.

another. This roof is pierced near its anterior margin for the abducens nerve in the usual manner. In front the lateral walls of the myodome are formed of a single sheet of bone only; this is traversed, as seen from the outside, by the facial nerve. It appears that this nerve ran in an open canal in the myodome wall for a short distance between its separation from the hyomandibular trunk and its appearance on the outside of the cranium,

The hind part of the prootic houses the anterior and ventral portion of the otic capsule between the myodome and external wall; this double structure is continued posteriorly by the basioccipital. In consequence, whereas the lower half of the otic cavity is surrounded by bone both inside and out, above the level of the myodome roof it is in free communication with the cranial cavity.

In the saccular region the inward bulge of the otic capsule is more pronounced, and finally the side-walls of the myodome meet each other dorsally, while behind the chamber is terminated by the front wall of a median conical cavity arising from the aortic canal and directed forwards and upwards beneath the end of the notochord pit.

The cranial cavity offers little for comment: its most striking feature is the entire absence of any bony laminæ surrounding the semicircular canals, which must have lain freely in the cavity. In front the wall of the trigemino-facial chamber protrudes inwards to meet the dorsal wings of the basisphenoid. The foramina piercing this wall have already been described.

Ethmoid Region.

This is not so well ossified as the postorbital part of the neurocranium; in the fossil state it usually consists of a thin laminæ of bone overlying calcite. When well preserved it is seen to form the hind walls and part of the floor and median wall of a large nasal capsule, the front part of which, as already stated, consists of the fused vomer and rostral bone. Between the front margin of the orbitosphenoid and ethmoid region the olfactory nerves lay for a space in the orbit, or possibly enclosed in the interorbital membrane.

Pectoral Girdle and Fins.

The suprascapular is attached to the skull close to the median crest of the supraoccipital by a long pointed process, and to the epiotic by a slight rounded one. At this point the sensory canal from the extrascapular enters the bone, and, after giving off a few short branches, emerges again at the hind corner. From the underside of the canal, about halfway along its length, arises a curved process which was originally connected by a ligament to the intercalar.

The supracleithrum carries the hindermost portion of the main lateral line canal before it passes on to the body-scales. It is a simple elongated bone with a thickened anterior border, and is slightly overlapped by the suprascapular above, and overlaps the cleithrum below. The latter is a large curved bone, rather complex in shape. It is divided longitudinally by a thickened ridge; behind this it is slightly convex outwards, and bears fine curved striations, while in the anterior hollow

Fig. 13 A.

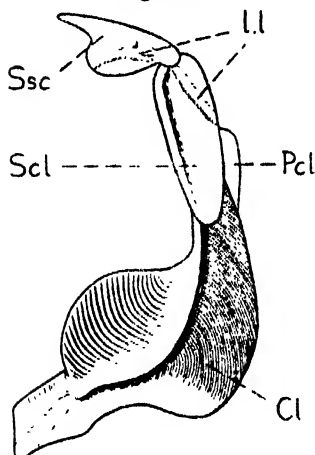


Fig. 13 B.

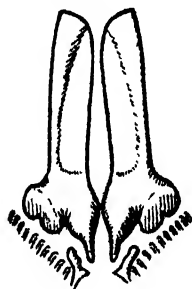


Fig. 13 A.—Dorsal bones of pectoral girdle, left side, external view. $\times 5$. Cl, cleithrum; l.l., cephalic division of main lateral line canal; Pcl, postcleithrum; Scl, supracleithrum; Ssc, suprascapular.

Fig. 13 B.—Pelvic girdle, $\times 6.6$.

of this posterior part lies a plain portion, concave outwards. The postcleithrum is long, narrow, and delicate, and is largely overlapped by the other dermal bones.

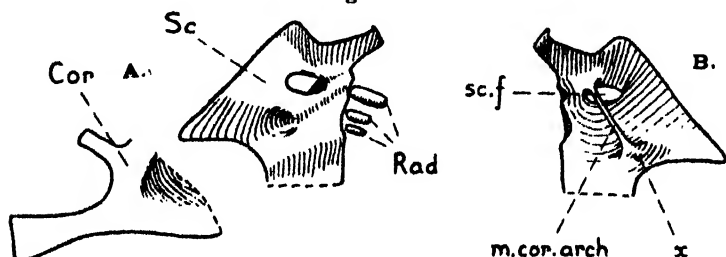
The primary part of the shoulder-girdle is only rarely seen, being normally hidden under the cleithrum, but where the membrane bones are somewhat broken or disturbed sufficient of the primary ossifications have been found to indicate something of their structure. The scapula is irregular in shape, with a fairly large scapular foramen in the upper part. On the inner side, slightly posterior to this foramen, is a delicate mesocoracoid arch, the ventral base of which is pierced by the posterior

diazonal nerve. Whether a similar foramen is present for the anterior nerve is unknown, the upper end of the mesocoracoid arch being incomplete, but the latter was certainly very narrow, and the nerves may well have passed in front of it.

The proximal end of the coracoid is not known; distally it consists of a flat shaft the long axis of which is horizontal. Three radials are attached to the hind margin of the scapula.

The pectoral fin consists of about twelve lepidotrichia, jointed for the most part of their length and branching twice.

Fig. 14.



Primary pectoral girdle left side. A. External view of coracoid and scapula, $\times 6.6$. B. Internal view of scapula, 6.6 . Cor, coracoid; m.cor.arch, mesocoracoid arch; Rad, radial; Sc, scapula; sc.f, scapular foramen; x, foramen for posterior diazonal nerve.

Pelvic Girdle and Fins.

The pelvic bone takes the form of an elongated triangular sheet, thin for the most part but with a stouter lateral border. The narrow base is irregularly thickened for articulation with the fin, and also has a posterior spine on the inner side. The lepidotrichia of the fin number roughly eleven; there are no independent radials, but the innermost fin-ray has an enlarged basal portion with which several of the neighbouring rays articulate.

Axial Skeleton and Median Fins.

With regard to the remaining part of the skeleton there is little to add to previous descriptions. The vertebræ number about forty; the first of these differs from the others in having a delicate but complete hæmal arch, very similar to the aortic canal of the occipital region

of the skull. Anteriorly it reaches as far forward as the centrum, but posteriorly the latter projects behind it. The centra are thin cylinders of bone, somewhat constricted in the centre, and always greater in length than in diameter. In the abdominal region they bear paired ventral arcualia extending nearly horizontally from the lower side of the cylinder; these articulate with the long curved pleural ribs. The neural arches are more loosely connected with the vertebræ; the two halves do not meet each other dorsally, and each bears a long neural spine directed somewhat backwards. A number of intermuscular bones lie across these spines in the front part of the trunk.

In the caudal region the ventral and dorsal arcualia fuse, forming complete neural and hæmal arches bearing spines. The hindmost hæmal arches (hypurals) are much expanded, and articulate with the lepidotrichia supporting the ventral lobe of the caudal fin. The last centrum is drawn out into a short bony rod; both it and the penultimate centrum bear two hæmal arches.

The dorsal fin consists of roughly thirteen radials surmounted by an equal number of lepidotrichia; the anterior radials sometimes fuse. The anal fin is similar, but contains about nine only of these elements. The lepidotrichia are jointed for about half their length and each branches twice.

The lepidotrichia of the caudal fin can be divided into those arising from the dorsal and ventral sides of the vertebral column (*i. e.*, epaxial and hypaxial rays respectively). The epaxial remain single but the hypaxial are jointed and may branch as many as three times, the ultimate divisions being extremely fine. The greatest length of the upper lobe is formed by the first hypaxial ray, and that of the lower by about the eighteenth. In front of the latter on the ventral side are approximately eight shorter lepidotrichia, supported by the more anterior hypurals. Dorsally, however, behind a similar number that end freely above the hindmost neural arches are four minute scale-like rays that arise from the first hypaxial ray. These are the remnants of the fulcral scales of the typical ganoids; they have also been described in the recent Teleost *Megalops* by Tate Regan (1910).

DISCUSSION.

Where an exact classification of the Teleostomes into Holostei and Teleostei has been adopted the Leptolepidæ have at different times found a place in both; but it is also admitted that such a rigid division is often not practicable in fossil forms, and that the two groups merge into one another. It may be, therefore, that the natural relations of the family are better expressed by considering it, where possible, as an assemblage of passage forms between the two, showing some of the characteristics of both. Much of the detailed structure of *Leptolepis bronni* set forth above is hitherto unrecorded, and will be used as a basis to re-examine briefly this question of affinity. In general it appears to confirm previous opinions on this intermediate position of the genus, and especially the suggestion that in many ways it comes very close to the generalized primitive Teleost.

The two specific characters of *Leptolepis* which would place it in the Holostei (or in the larger group "Ganoidei") are the perforation of the centra by the notochord and the covering of ganoin to bones and scales. The perforation is small, however, and the covering very thin, and when compared, for instance, with the related genus *Pholidophorus* it is the slightness of these characters in *Leptolepis* that is most striking, showing an approach to the Teleosts which have neither.

The Leptolepidæ are easily separated from other more distant Mesozoic Ganoids both by specific characters of dermal bones, scales, fins, etc., and by the general appearance of the skull, except in so far as all are bound together by a fundamental plan common to all Actinopterygii above the Palæoniscids. The neurocrania of fossil ganoids are almost undescribed, and what is known (e. g., of *Lepidotus*) indicates as great a divergence in this structure as that shown by the external features. Apart from the general difference caused by less ossification and smaller optic fenestra in *Lepidotus*, especial mention may be made of the lack of supraoccipital and aortic canal in Stensiö's figure, and the great dissimilarity in all the hind region of the skull (Stensiö, 1932, p. 253).

Of the living ganoids *Lepidosteus* is probably a specialized derivative of the Semionotidæ, while *Amia* and its

forerunner, *Sinamia* (Stensiö, 1935), must also have evolved considerably from their earlier fossil ancestor. Thus there is little here to compare directly with the structure seen in *Leptolepis*, and the connection between them must be remote.

Taking the comparison further back, the apparent Palæoniscid character of the lateral line canals commented on here and by Piveteau (1934, p. 73) will be dealt with in a paper by Dr. T. S. Westoll, and it is only necessary to mention here that, though unrecorded, it is sometimes found in other Holostean groups*. There is also a certain superficial resemblance between the neurocrania of *Leptolepis* and of the Kansas Palæoniscids described by Watson (1925); this is partly owing to the completeness of the ossification and rather rounded outlines, unlike those of typical Teleost neurocranium, which is usually much excavated for muscle attachment. In addition there is a very real resemblance in the presence of a complete aortic canal formed from the basioccipital, though shorter and less massive than that of the Palæoniscids.

The parasphenoid agrees with the type considered by Stensiö to be found in all Holostei and Teleostei. This is shown by the course of the internal carotid, which pierces the foot of the ascending process and passes for the most part internally to it. Thus it is, strictly speaking, an anterior processus ascendens, and is not homologous with that of the Kansas Palæoniscids (a posterior processus ascendens), where the internal carotids pass below the process and turn up in front of it to reach the basisphenoid region (see Stensiö, 1925, pp. 85-88).

A basipterygoid process is present in Palæoniscids, Ospiide, and Perleidids, either formed from the basis cranii or that reinforced by the parasphenoid. The same name has been used in describing structures in both *Lepidotus* (Smith Woodward, 1893) and *Dapedius* (Frost 1913). In the former, however, the single wing protruding from the parasphenoid appears to bear similar relations to the internal carotid as an ascending process; certainly it is treated as such by Stensiö (1925,

* My thanks are due to Dr. Westoll for allowing me to incorporate this information.

loc. cit.). The basipterygoid process mentioned by Frost is described as being produced upwards and backwards across the alisphenoid and meeting the orbitosphenoids—a position obviously indicating that it is really an ascending process. In a rough figure, however, a small rounded knob is shown in front of the larger wing which may well represent a true basipterygoid process. Moreover, while Stensiö (1932) has figured a *Lepidotus* neurocranium that shows no sign of a second lateral extension, Smith Woodward does mention a facet on the metapterygoid which may have articulated with some such element. It is quite possible, therefore, that the palato-basal articulation existed in the Semionotidæ also *.

The living Teleostomes with this articulation are *Lepidosteus* and the Osteoglossidæ. *Lepidosteus* is exceptional in that the prootic also takes part in the articulating projection. The Osteoglossidæ are a primitive group of Teleosts in which the arrangement is very much as in *Leptolepis*; the basipterygoid process contains one foramen near its base and another pierces the ascending wing, which in this case is connected by a suture with the alisphenoid, prootic, and basioccipital.

Bridge (1895) compared this articulation in *Osteoglossum* and *Lepidosteus* (the only other known case among Teleostomes at the time), and suggested that it was connected with the feeding habits of the two fish: in *Osteoglossum* the ethmoid-palatine connection is loose and a certain amount of lateral play between the two possible, while in *Lepidosteus*, though this articulation does not exist, a similar movement is possible from the flexibility of the palate and the looseness of its connection with the bones of the beak. In both cases, therefore, the secondary articulation with the skull would be a lateral sliding mechanism while preventing movement in a fore-and-aft direction. Bridge connected this mechanism with the powerful teeth and large prey of both fish, which also possess a long toothed tongue; thus he would have attributed the resemblance to parallel evolution. Turning to *Leptolepis*, however, we find that while such

* Since writing this I have received and examined the specimen of *Lepidotus* figured by Professor Stensiö. On the reverse (left) side I have found a distinct basipterygoid process, the point of which is closely connected with the palate. I am deeply indebted to Professor Stensiö for the loan of this specimen.

a sliding movement is perfectly possible from a mechanical point of view, no such connected feeding habit can be presumed. The small delicate teeth and thin jaw-bones of this fish can never have captured prey of any size, and it probably lived on plankton.

The rudiment of a similar articulating process has been found in the developing palato-quadrato of *Salmo* (de Beer, 1927), though it does not survive to be ossified as an articulation in the adult. The same is true of *Amia*. From this and its occurrence in the Osteoglossidae and *Lepidosteus* Swinnerton (1902) suggested that rather than a parallel evolution their occasional appearance might be the remnants of an additional method of jaw suspension once more general. Both Stensiö (1932, p. 79) and Goodrich (1930) have also considered this palato-basal method to be a very primitive feature—shown in Dipnoans, Crossopterygians, and Tetrapods as well as the lower Teleostomes. On the other hand, Goodrich suggested that that in the Osteoglossidae was probably secondary. The appearance of this articulation in *Leptolepis*, a generalized form so near the primitive Teleosts, makes it possible, however, that it has been retained longer than has hitherto been supposed, though in its later history the function of articulation has been entirely taken over by the parasphenoid. It is hoped that further investigation of the neurocrania in Holostei may help to settle the matter.

Finally, we turn to consider *Leptolepis* in relation to the primitive Teleosts. It is obvious that it very closely approaches these, only separated from them by the last remnants of Holostean characters already mentioned. In structure it is singularly generalized, with perhaps the exception of the abrupt coronoid process placed unusually far forward on the lower jaw. Given this primitive plan it is fairly easy to derive the lowest Teleost families from *Leptolepis*, though each on individual lines.

The Elopidae is the only family that still possesses a gular among the Teleosts; it was originally considered by Smith Woodward (1901, p. vi) that they could not be directly derived from the Leptolepidae owing to the lack of this bone in the latter group. Its discovery now removes this bar, and the Elopidae, which are known from the Lower Cretaceous, probably come nearest to the direct line of descent. The Albulidae are a neighbouring group, slightly

further removed by the loss of the gular and forward position of the jaw suspensorium.

Of the other isospondylus families that still show generalized or archaic features the Osteoglossidae have been already discussed; they are somewhat specialized, however, in the thickened bones of the head, broad nasals which meet in the middle line, and expanded plates behind the eye. The Clupeidae are near the original Teleost stock, though slightly further advanced than the Elopidae, in that the supratemporo-intertemporal is reduced and the skull much excavated for muscle attachment. They also show the separation of the parietals by the supraoccipital, the reverse of which is generally supposed to be a primitive character; certainly it occurs in families that are primitive in other ways, and only a very small portion of the supraoccipital is seen on the surface of the skull of *Leptolepis*.

Thus, while no systematic attempt is made here to discuss the phylogeny of the Teleosts, it is hoped that enough has been shown to confirm the important place taken by *Leptolepis* near, though not necessarily at, the origin of their history.

Turning to the other side of the question, the antecedents of *Leptolepis* itself are much more conjectural. That it is connected with the Pholidophoridae appears probable, species of the two coming sometimes very close to one another. But whether the Leptolepidae have any direct relation with the Semionotidae, the most generalized of the Holostean families, or whether they must be traced back separately to some Palæoniscid ancestor, as at present seems more likely, is a matter for further investigation.

REFERENCES.

- ARAMBOURG, C. 1935. "Contribution à l'étude des Poissons du Lias Supérieur." Ann. de Paléont., xxiv. pp. 3-32.
- BEER, G. R. DE. 1927. "The Early Development of the Chondrocranium in *Salmo fario*." Quart. Journ. Micros. Soc. lxxii. no. 262, pp. 259-312.
- BRIDGE, T. W. 1895. "On certain Features in the Skull of *Osteoglossum formosum*." Proc. Zool. Soc. pp. 302-310.
- FROST, G. A. 1913. "The Internal Cranial Elements and Foramina of *Dapedius granulatus*." Quart. Journ. Geol. Soc. lxxix. pp. 219-222.
- GOODRICH, E. S. 1930. 'Structure and Development of Vertebrates.' London.
- PIVETEAU, J. 1934. "Paléontologie de Madagascar.—XXI. Les Poissons du Trias Inférieur." Ann. de Paléont. xxiii. pp. 83-178.

- REGAN, C. T. 1910. "On the Caudal Fin of the Elopidae and of some other Teleostean Fishes." *Ann. & Mag. Nat. Hist.* ser. 8, vol. v. pp. 354-361.
- STENSIÖ, E. A. 1925. 'Triassic Fishes from Spitzbergen.' *Stockholm*.
- . 1932. "Triassic Fishes from East Greenland." *Medd. om Grönl.* lxxxiii. no. 3.
- . 1935. "*Sinamia zdanskyi*, a new Amioid from the Lower Cretaceous." *Palæontologica Sinica*, ser. C, vol. iii. fasc. 1, pp. 1-48.
- SWINNERTON, H. H. 1902. "A Contribution to the Morphology of the Teleostean Head Skeleton based upon the Developing Skull of . . . *Gasterosteus aculeatus*." *Quart. Journ. Micros. Soc.* v. no. 180, pp. 503-593.
- WATSON, D. M. S. 1925. "The Structure of certain Palæoniscoids." *Proc. Zool. Soc.* pp. 815-870.
- WESTOLL, T. S. 1937. "Cheek-bones in Teleostome Fish." *Journ. Anat.*
- WOODWARD, A. S. 1893. "On the Cranial Osteology of the Mesozoic Ganoid Fishes *Lepidotus* and *Dapedius*." *Proc. Zool. Soc.* pp. 559-565.
- . 1895. 'Catalogue of Fossil Fishes.'—Part III. *Brit. Mus. Nat. Hist.*
- . 1901. 'Catalogue of Fossil Fishes.'—Part IV. *Brit. Mus. Nat. Hist.*

III.—*A List of the Denny Collection of Mallophaga in the British Museum (Natural History) and of their Hosts.* By GORDON B. THOMPSON, Department of Entomology, British Museum of Natural History.

THIS paper consists of a list of the species of Mallophaga described by Henry Denny in 1842 in his book entitled 'Monographia Anoplurorum Britanniae,' together with a complete list of the hosts from which Denny recorded his species and the number of his specimens at present contained in the collection at the British Museum.

A part of the Denny Collection was purchased by the British Museum from the author in 1852; the location of the remainder of this collection is at present unknown to me. Originally Denny's specimens were mounted dry on cards, but during the past years all the specimens have been treated with caustic potash and mounted in Canada balsam. I am unable to state to whom the credit of mounting the Denny specimens is due, but it is certain that the late Bruce F. Cummings and Dr. James Waterston worked on this collection.

In presenting the information given below I have not given the references to the species, as these may be easily

ascertained by reference to Denny's book. The information is presented in tabular form, and is set out as follows:— The first column contains the name of the species described by Denny, together with the synonymy as given by Harrison (1916)*; the second column contains the number of specimens at present contained in the British Museum (in cases where no specimens are contained in the British Museum this is indicated by a dash); the third column contains first of all the type-host (in heavy type), followed by the names of any other hosts from which Denny recorded the species. All the host-names are corrected to date in accordance with 'A Check-List of British Birds' by H. F. Witherby (London, 1924), and I should like to take this opportunity of expressing my indebtedness to Mr. H. F. Witherby for help with some of the older names for which I was unable to find a present-day name.

In the past little attention has been paid to the subject of type-hosts. The type-host of a species of Mallophaga is the host from which the material comprising the type-series of the Mallophagan species is obtained. It is evident, however, that in endeavouring to settle the synonymy of any species of Mallophaga the name of the type-host is of utmost importance.

Species.	No. of specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>Menopon carduelis</i> Denny	—	Carduelis carduelis britannica (Hart.). (British Goldfinch.)
<i>M. citrinella</i> Denny	1 ♂.	Emberiza c. citrinella L. (Yellow Bunting.)
	1.	<i>Motacilla alba yarrellii</i> Gould. (Pied Wagtail.)
<i>M. fulvomaculatum</i> Denny ...	—	Coturnix c. coturnix (L.). (Quail.)
<i>M. fuscocinctum</i> Denny	—	Phasianus colchicus L. (Pheasant.)
(= <i>M. coarctatum</i> (Scopoli).)		Lanius c. collurio L. (Red-backed Shrike.)
<i>M. nigropleurum</i> Denny	—	Alca torda L. (Razorbill.)
		Philomachus pugnax (L.). (Ruff.)
		Tringa t. totanus (L.). (Common Red-shank.)
		Numenius a. arquata (L.). (Common Curlew.)
		Rissa t. tridactyla (L.). (Kittiwake Gull.)

* Harrison, L. (1916), 'Parasitology,' ix. pp. 1-156.

Species.	No. of specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>M. ridibundus</i> Denny.....	—	<i>Larus r. ridibundus</i> L. (Black-headed Gull.)
<i>M. streptilas</i> Denny	—	<i>Arenaria l. interpres</i> (L.). (Turnstone.)
<i>M. transversum</i> Denny	1 ♀.	<i>Rissa t. tridactyla</i> (L.).
(= <i>M. ridibundus</i> Denny.)		<i>Alca torda</i> L.
<i>Myrsidea troglodytis</i> (Denny) ..	2 ♀♀.	<i>Troglodytes t. troglodytes</i> (L.). (Wren.)
<i>Menacanthus giganteus</i> (Denny)	—	<i>Columba oenas</i> L. (Stock Dove.)
<i>M. pici</i> (Denny)	2 ♀♀.	<i>Picus viridis virescens</i> (Brehm). (Green Woodpecker.)
<i>Neumannia perdicis</i> (Denny) ..	3 ♀♀.	<i>Perdix p. perdix</i> (L.). (Pheasant.)
<i>Kurodaia halizeti</i> (Denny) ...	7 ♀♀, 1 ♂.	<i>Pandion h. hallastus</i> (L.). (Osprey.)
<i>Colpocephalum fregili</i> Denny ..	—	<i>Pyrhocorax p. pyrrhocorax</i> (L.). (Chough.)
<i>C. importunum</i> Nitzsch in Denny. (= <i>C. decimfasciatum</i> Boisduval & Lacordaire.)	—	<i>Ardea c. cinerea</i> L. (Common Heron.)
<i>C. nyctarde</i> Denny	—	<i>Nycticorax n. nycticorax</i> (L.). (Night Heron.)
<i>C. turbinatum</i> Denny.....	—	"Domestic Pigeon."
<i>Actornithophilus piceus</i> (Denny)	—	<i>Sterna s. sandvicensis</i> Lath. (Sandwich Tern.)
<i>Dennyus burmeisteri</i> (Denny) ..	2 ♂♂, 2 ♀♀.	<i>Apus a. apus</i> (L.). (Swift.)
(= <i>D. truncatus</i> (Olfers).)		<i>Anser albifrons</i> (Scop.). (White-fronted Goose.)
<i>Trinoton aequalidum</i> Denny ...	2 imm.	<i>Spatula clypeata</i> (L.). (Shoveler.)
(= <i>T. querquedula</i> Linn.)		"Domestic Goose."
<i>Pseudomenopon scopulacorne</i> (Denny).	—	<i>Rallus a. aquaticus</i> L. (Water Rail.)
(= <i>P. tridens</i> (Nitzsch in Burmeister).)	3 ♀♀.	<i>Gallinula c. chloropus</i> (L.). (Moorhen.)
<i>Læmbothrion laticolle</i> Nitzsch in Denny.	—	<i>Podiceps r. ruficollis</i> (Pall.). (Little Grebe.)
(= <i>Læmbothrion tinnunculi</i> Linn.)		<i>Falco s. subbuteo</i> L. (Hobby.)
<i>Eulæmbothrion atrum</i> (Nitzsch in Denny).	—	<i>Fulica a. atra</i> L.
<i>Ricinus bombycilla</i> (Denny) ..	3 ♀♀.	<i>Bombeyella garrulus</i> (L.). (Waxwing.)
<i>Trichodectes crassus</i> Nitzsch in Denny.	4 ♀♀, 1 imm.	<i>Plectrophenax n. nivalis</i> (L.). (Snow Bunting.)
(= <i>T. melis</i> (Fabricius).)		<i>Meles m. meles</i> (Linn.). (Badger.)
<i>T. dubius</i> Nitzsch in Denny ...	—	<i>Mustela erminea stabilis</i> Barrett-Hamilton. (Stoat.)
(= <i>T. mustela</i> (Schrank).)		<i>Mustela n. nivalis</i> Linn. (Weasel.)
<i>T. vulpis</i> Denny	5 ♀♀.	<i>Vulpes vulpes crucigera</i> (Bechstein). (Fox.)
<i>Bovicola equi</i> (Denny)	—	"Horse," "Ass."
(= <i>B. equi</i> (Linn.).)		<i>Cervus elaphus scoticus</i> Lönnerberg. (Red Deer.)
<i>B. similis</i> (Denny)	—	
(= <i>B. cervi</i> (Linn.).)		

Species.	No. of specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>Goniodes colchici</i> Denny	6 ♀♀, 3 ♂♂.	<i>Phasianus colchicus</i> L. (Pheasant.)
<i>G. dissimilis</i> Nitzsch in Denny	—	" Domestic Fowl."
<i>G. numidianus</i> Denny	2 ♀♀.	<i>Numida meleagris</i> (L.). (Guinea Fowl.)
<i>G. ortygis</i> Denny	1 ♂, 2 ♀♀.	<i>Collinus virginianus</i> (L.). (Bob-white.)
<i>Goniocotes hologaster</i> Denny	—	" Domestic Fowl."
(= <i>G. gigas</i> Taschenberg.)	—	
<i>Lipeurus numida</i> (Denny)	—	<i>Numida meleagris</i> (L.).
<i>Philopterus alcedinis</i> (Denny)	—	<i>Alcedo atthis ispida</i> L. (Kingfisher.)
<i>P. aquilinus</i> (Denny)	—	<i>Aquila c. chrysaëtus</i> (L.). (Golden Eagle.)
		<i>Halizetus a. albicilla</i> (L.). (White-tailed Eagle.)
		<i>Pernis a. apiornis</i> (L.). (Honey Buzzard.)
<i>P. atratus</i> (Nitzsch in Denny)	4 ♂♂, 7 ♀♀.	<i>Corvus f. frugilegus</i> L. (Rook.)
		<i>Corvus c. cornix</i> Linn.*. (Hooded Crow.)
<i>P. canuti</i> (Denny)	—	<i>Callidris c. canutus</i> (L.). (Knot.)
(= <i>P. fusiformis</i> (Denny).)	—	
<i>P. cephalus</i> (Denny)	—	<i>Stercorarius parasiticus</i> (L.). (Arctic Skua.)
		<i>Stercorarius pomarinus</i> (Tomm.). (Pomatorhino Skua.)
		<i>Tringa hypoleucos</i> L. (Common Sandpiper.)
		<i>Charadrius h. hiaticula</i> L. (Ringed Plover.)
<i>P. chrysophthalmi</i> (Denny)	—	[<i>Aquila c. chrysaëtus</i> (L.).] (Golden Eagle.)
		[Host given by Denny as <i>Bucephala c. clangula</i> (Linn.) (Goldeneye), but, as has been pointed out by previous workers, it appears to be a mistake for Golden Eagle.]
<i>P. cincli</i> (Denny)	2 imm.	<i>Cinclus cinclus gularis</i> (Latham). (British Dipper.)
<i>P. colymbinus</i> (Denny)	4 ♀♀ †.	<i>Colymbus stellatus</i> Pontopp. (Red-throated Diver.)
		<i>Colymbus a. arcticus</i> L. (Black-throated Diver.)
		<i>Colymbus i. immer</i> Brünn. (Great Northern Diver.)
<i>P. conicus</i> (Denny)	—	<i>Charadrius apricarius</i> ssp. (Golden Plover) ? Southern or Northern ssp.
<i>P. fringilla</i> (Denny)	2 ♀♀.	<i>Fringilla montifringilla</i> L. (Brambling.)
(= <i>P. subflavescens</i> (Geoffroy).)	—	
<i>P. fusiformis</i> (Denny)	—	<i>Callidris minuta</i> (Leisl.). (Little Stint.)
<i>P. guttatus</i> (Nitzsch in Denny)	3 ♂♂, 2 ♀♀.	<i>Corvus monedula spermologus</i> (Vieill.). (British Jackdaw.)

* The specimens recorded by Denny are really *P. corvi* (Linn.); see Thompson, 1935.

† Denny's specimens are labelled as being taken off *Colymbus* sp.

Species.	No. of specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>P. humeralis</i> (Denny)	4 ♀♀.	<i>Numenius a. arquata</i> (L.). (Curlew.) <i>Numenius p. phaeopus</i> (L.). (Wim- brel). <i>Sula bassana</i> (L.). (Gannet.) <i>Uria aalge</i> asp. (Guillemot.)
<i>P. limosa</i> (Denny)	1 ♀.	<i>Limosa l. lapponica</i> (L.). (Bar-tailed Godwit.) <i>Limosa l. limosa</i> (L.). (Black-tailed Godwit.) <i>Uria g. grylle</i> (L.). (Black Guillemot.)
<i>P. megacephalus</i> (Denny) (= <i>P. grylle</i> (O. Fabricius).)	—	<i>Alle a. alle</i> (L.). (Little Auk.)
<i>P. merguli</i> (Denny)	—	<i>Turdus m. merula</i> L. (Blackbird.)
<i>P. merula</i> (Denny)	1 ♂, 7 ♀♀.	<i>Turdus pilaris</i> L. (Fieldfare.) <i>Turdus t. torquatus</i> L. (Ring-Ouzel.)
<i>P. modularis</i> (Denny) (= <i>P. subflavescens</i> (Geof. froy).)	2 ♀♀.	<i>Prunella modularis occidentalis</i> (Hart.). (British Hedge-Sparrow.)
<i>P. nisi</i> (Denny)	1 ♂, 3 ♀♀.	<i>Acipiter n. nisus</i> (L.). (Sparrow- Hawk.)
<i>P. ostralegi</i> (Denny) (= <i>P. sturni</i> (Schränk); Har- rison, 1916, p. 101.)	2 ♂♂, 1 ♀.	<i>Hæmatopus ostralegus occidentalis</i> Neumann. (British Oyster Catcher.)
<i>P. pallascens</i> (Denny) (= <i>P. subflavescens</i> (Geoffroy).)	—	<i>Parus palustris dresseri</i> Stejn. (British Marsh Titmouse.) <i>Parus major newtoni</i> Pražák. (British Great Titmouse.)
<i>P. pari</i> (Denny) (= <i>P. subflavescens</i> (Geof- froy).)	1 ♂ *.	<i>Ægithalos caudatus roseus</i> (Blyth). (British Long-tailed Titmouse.) <i>Parus ater britannicus</i> Sharpe & Dress. (British Coal Titmouse.) <i>Parus caeruleus obscurus</i> Pražák. (British Blue Titmouse.)
<i>P. passerinus</i> (Denny)	1 ♂ †.	<i>Motacilla alba yarrelli</i> Gould. (Pied Wagtail.) <i>Motacilla flava rayi</i> (Bp.). (Yellow Wagtail.) <i>Acrocephalus schoenobaenus</i> (L.). (Sedge Warbler.)
<i>P. pastoris</i> (Denny) (= <i>P. sturni</i> (Schränk).)	1 ♀.	<i>Pastor roseus</i> (L.). (Rose-coloured Starling.)
<i>P. pica</i> (Denny)	1 ♀.	<i>Pica p. pica</i> (L.). (Magpie.)
<i>P. platygaster</i> (Denny)	—	<i>Uria aalge</i> asp. (Guillemot.) <i>Charadrius mormellus</i> L. (Dotterel.) <i>Charadrius h. hiaticula</i> L. (Ringed Plover.)
<i>P. ralli</i> (Denny)	—	<i>Rallus a. aquaticus</i> L. (Water Rail.)
<i>P. reguli</i> (Denny)	1 ♀.	<i>Regulus regulus anglicorum</i> Hart. (British Golden-crested Wren.)

* Denny's specimen is labelled as having been taken off *Parus* sp.† Denny's specimen is labelled as having been taken off *Motacilla* sp.

Species.	No. of specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>P. rubecula</i> (Denny)	1 ♂, 3 ♀♀.	<i>Erithacus rubecula melophilus</i> Hart. (British Robin.) <i>Fringilla c. coelebs</i> L. (Chaffinch.) <i>Plectrophenax n. nivalis</i> (L.). (Snow Bunting.)
<i>P. thalassidrome</i> (Denny)	2 ♀♀.	<i>Hydrobates pelagicus</i> (L.). (Storm Petrel.)
<i>P. turdi</i> (Denny)	2 ♀♀.	<i>Turdus e. ericetorum</i> Turton. (British Song Thrush.)
<i>P. variabilis</i> (Denny)	1 ♀*.	<i>Callidris alpina schinzii</i> (Brehm). (Southern Dunlin.)
<i>Eustrigiphilus ceblebrachyn</i> (Nitzsch in Denny).	3 ♀♀.	<i>Nyctea scandiaca</i> (L.). (Snowy Owl.)
<i>Anatascus cygni</i> (Denny)	4 ♀♀, 1 ♂.	<i>Cygnus b. bewickii</i> Yarr. (Bewick's Swan.) <i>Anser f. fabalis</i> (Lath.). (Bean Goose.)
<i>Neophilopterus incompletus</i> (Nitzsch in Denny).	2 ♀♀.	<i>Cleonla c. cleonla</i> (L.). (White Stork.)
<i>Oculocacus latifrons</i> (Nitzsch in Denny).	—	<i>Cuculus c. canorus</i> L. (Cuckoo.) <i>Jynx t. torquilla</i> L. (Wryneck.)
<i>C. meropis</i> (Denny)	2 ♀♀.	<i>Merops apilaster</i> L. (Bee-eater.)
<i>Ibidacus platensis</i> (Denny)	1 ♂, 5 ♀♀.	<i>Platalea l. leucorodia</i> L. (Spoonbill.)
<i>Cummingiella testudinaria</i> (Denny).	—	<i>Numenius a. arquata</i> (L.). (Common Curlew.)
<i>Degeneriella alce</i> (Denny)	1 ♀.	<i>Alca torda</i> L. (Razorbill.)
<i>D. apiastri</i> (Denny)	1 ♂ (headless).	<i>Merops apilaster</i> L.
<i>D. cingulata</i> (Nitzsch in Denny)	3 ♀♀ †.	† <i>Limosa l. limosa</i> (L.). (Black-tailed Godwit.) <i>Limosa l. lapponica</i> (L.). (Bar-tailed Godwit.) <i>Philomachus pugnax</i> (L.). (Ruff.) <i>Cuculus c. canorus</i> L.
<i>D. cuculi</i> (Denny)	2 ♀♀.	
(= <i>D. latirostris</i> (Burmeister).)		
<i>D. decipiens</i> (Nitzsch in Denny).	3 ♀♀, 1 ♂.	<i>Recurvirostra avosetta</i> L. (Avocet.)
<i>D. elongata</i> (Denny)	3 ♀♀.	<i>Delichon u. urbica</i> (L.). (Martin.)
<i>D. fusca</i> (Nitzsch in Denny)	(See below) ‡.	<i>Circus aeruginosus</i> (L.). (Marsh Harrier.) <i>Buteo b. buteo</i> (L.). (Common Buzzard.) <i>Milvus m. milvus</i> (L.). (Kite.) <i>Buteo l. lagopus</i> (Brünn.). (Rough-legged Buzzard.)
<i>D. fuscomarginata</i> (Denny)	—	<i>Podiceps auritus</i> (L.). (Slavonian Grebe.)
<i>D. glandarii</i> (Denny)	2 ♀♀, 1 imm.	<i>Garrulus glandarius rustergum</i> Hart. (British Jay.)

* Denny's specimen is labelled as having been taken off *Tringa variabilis*.

† Denny's specimens are labelled as being taken off *Limosa* sp. (Godwit).

‡ There are some of Denny's specimens of *D. fusca*, but they bear no data as to host etc.

Species.	No. of specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>D. hæmatopi</i> (Denny)	1 ♀.	<i>Hæmatopus ostralegus occidentalis</i> Neumann. (British Oyster-catcher.)
<i>D. iliaci</i> (Denny)	1 ♂, 2 ♀♀. 1 imm. }	<i>Turdus m. musicus</i> L. (Redwing.) <i>Pastor roseus</i> (L.). (Rose-coloured Starling.)
<i>D. meridensis</i> (Denny)	9 ♀♀, 1 ♂.	<i>Turdus m. merula</i> L. (Blackbird.)
<i>D. numenii</i> (Denny)	2 ♀♀, 2 ♂♂. 1 imm.	<i>Numenius a. arquata</i> (L.). (Common Curlew.) <i>Fulica a. atra</i> L. (Coot.)
<i>D. ochropi</i> (Denny)	1 ♀.	<i>Tringa ochropus</i> L. (Green Sand-piper.)
<i>D. ædionemi</i> (Denny)	1 ♂*.	<i>Burhinus ædionemus</i> (L.). (Stone Curlew.)
<i>D. phæopi</i> (Denny)	3 ♂♂.	<i>Numenius p. phæopus</i> (L.). (Wimbrel.) " <i>Tringa subarquata</i> . (Pigmy Curlew.) "
<i>D. phalaropi</i> (Denny)	4 ♀♀, 3 ♂♂.	<i>Phalaropus fulicarius</i> (L.). (Grey Phalarope.)
<i>D. podiceps</i> (Denny)	5 ♀♀, 2 ♂♂†.	<i>Podiceps r. ruficollis</i> (Pall.). (Little Grebe.) <i>Podiceps c. cristatus</i> (Linn.). (Great Crested Grebe.) <i>Podiceps g. griseigena</i> (Bodd.). (Red-necked Grebe.)
<i>D. rallina</i> (Denny)	—	<i>Rallus a. aquaticus</i> L. (Water Rail.)
<i>D. atraminea</i> (Denny)	1 ♂, 2 ♀♀.	<i>Dryobates major anglicus</i> (Hart.). (British Great-spotted Woodpecker.) <i>Picus viridis virescens</i> (Brehm). (Green Woodpecker.)
<i>D. strepsilaris</i> (Denny)	1 ♀.	<i>Arenaria i. interpres</i> (L.). (Turnstone.)
<i>D. tessellata</i> (Denny)	1 imm. ‡.	<i>Botaurus s. stellaris</i> (L.). (Bittern.)
<i>D. upupæ</i> (Denny)	5 ♀♀, 2 ♂♂.	<i>Upupa e. epops</i> L. (Hoopoe.)
<i>D. vanelli</i> (Denny)	2 ♂♂§, 2 ♀♀.	<i>Squatarola s. squatarola</i> (L.). (Grey Plover.) <i>Arenaria i. interpres</i> (L.). (Turnstone.)
<i>D. viscivori</i> (Denny)	1 ♀.	<i>Turdus v. viscivorus</i> L. (Mistle Thrush.)
<i>Rhynchornis scolopaciæ</i> (Denny)	2 ♀♀.	<i>Capella g. gallinago</i> (L.). (Common Snipe.)
<i>Rallicola attenuata</i> (Nitzsch in Denny). (= <i>R. ortygometræ</i> (Schränk).)	1 ♂.	<i>Orex orex</i> (L.). (Land Rail or Corn Crane.)

* The specimen which I take to be Denny's specimen of *D. ædionemi* is labelled "*D. annulata* (Burmeister)."†

† One male and one female specimen are labelled as having been taken off Fared Grebe—the remainder are labelled "off Grebe (*Podiceps* sp.)."

‡ See note in Harrison (1916), p. 124.

§ One male, labelled "off Roseate Tern—*Sterna dougalli*"—there is no mention of this host in Denny's book.

Species.	No. specimens in B.M.	Type-host and other hosts recorded by Denny.
<i>R. fulicæ</i> (Denny)	1 ♂.	<i>Fulica a. atra</i> L. (Coot.)
(= <i>R. cuspidata</i> (Scopoli).)		
<i>Ornithobius atomarginatus</i> Denny.	1 ♀.	<i>Branta canadensis</i> (L.). (Canada Goose.)
(= <i>O. gonioplurus</i> Denny.) . . .		
<i>O. gonioplurus</i> Denny	1 ♂, 2 ♀♀.	<i>Branta canadensis</i> (L.). <i>Mergus m. merganser</i> L. (Goosander.) <i>Caprimulgus e. europæus</i> L. (Night-jar.)
<i>Ethiopterum hypoleucum</i> (Nitzsch in Denny.)	—	<i>Fulica atra atra</i> L. (Coot.) <i>Gallinula c. chloropus</i> (L.). (Moorhen.)
<i>E. luridum</i> (Nitzsch in Denny).	—	<i>Anser albifrons</i> (Scop.). (White-fronted Goose.) <i>Branta bernicla bernicla</i> (L.). (Brent Goose.) <i>Anser f. fabalis</i> (Lath.). (Bean Goose.)
<i>Anaticola jejuna</i> (Nitzsch in Denny). (= <i>A. anseris</i> (L.).)	3 ♀♀*.	<i>Anas p. platyrhynchos</i> L. (Mallard.)
<i>A. squalidum</i> (Nitzsch in Denny).	1 ♂, 2 ♀♀†.	<i>Tadorna tadorna</i> (L.). (Sheld Duck.)
<i>A. tadornæ</i> (Denny)	2 ♀♀, 1 imm.	<i>Mergus serrator</i> L. (Red-breasted Merganser.) <i>Mergus m. merganser</i> L. (Goosander.)
<i>A. temporale</i> (Nitzsch in Denny). (= <i>A. serratæ</i> (De Geor).)	2 ♀♀.	<i>Botaurus s. stellaris</i> (L.). (Bittern.) <i>Hydrobates pelagicus</i> (L.). (Storm Petrel.) <i>Oceanodroma l. leucorhoa</i> (Vieill.). (Leach's Fork-tailed Petrel.)
<i>Ardeicola stellare</i> (Denny) . . .	1 ♀, 2 ♂♂.	<i>Haliaeetus a. albiellus</i> (L.). (White-tailed Eagle.)
<i>Synnautes pelagicus</i> (Denny) . .	1 ♀, 1 ♂.	<i>Otis t. tarda</i> L. (Great Bustard.)
<i>Falcolipeurus sulcifrons</i> (Donny)	4 ♀♀, 1 ♂.	<i>Sula bassana</i> (L.).
<i>Otilipeurus turmale</i> (Nitzsch in Denny).	3 ♀♀, 1 imm.	
<i>Pectinopygus staphylinoides</i> (Denny). (= <i>P. baseanæ</i> (Fabricius).)	4 ♀♀, 3 ♂♂, 1 imm.	<i>Sterna h. hirundo</i> L.†. (Common Tern.)
<i>Philichthyophaga gyricorne</i> (Denny).	—	<i>Phalacrocorax a. aristotellus</i> (L.). (Shag.) <i>Hematopus ostralegus occidentalis</i> Neumann. (British Oyster-catcher.)
<i>P. brevicorne</i> (Denny)	2 ♂♂, 2 ♀♀.	

* These specimens are labelled as having been taken off *Anser* sp. (Goose).

† Denny's specimen is labelled as having been taken off *Anas* sp. (Britain).

‡ This host is quite definitely not the true host of this parasite. It is in all probability *Phalacrocorax c. carbo* (L.) (Cormorant).

IV.—*A Note on a Collection of Polychæta from the Eastern Mediterranean, with the Description of a new Species.* By C. C. A. MONRO, Assistant Keeper in the Department of Zoology, British Museum.

DR. G. HAAS, of the University of Jerusalem, kindly submitted to me a small collection of Polychæta taken on the shores of Palestine between Acre and Jaffa. The majority were well-known Mediterranean forms, but there were also several species new to the Mediterranean and a new species of Ariciid, which I have much pleasure in naming *Scolaricia haasi*, after its collector. The new records are dealt with below.

Family Amphinomidæ.

Eurythoë complanata (Pallas).

Fauvel, 1932, p. 45, with citations.

Distribution.—Throughout the tropics, Eastern Mediterranean.

Remarks.—This well-known and widely distributed species is represented by twenty-one specimens, and appears to be common on the coast of Palestine. It has never before been signalled from the Mediterranean or the Suez Canal. On the other hand, Kinberg, in 1858 (p. 13), described an *Eurythoë syriaca* from the coast of Syria, which to the best of my knowledge has not been seen since the original record. Kinberg's description is brief, without illustration, and not recognizable with certainty; but in all probability he had before him an example of the present species. I therefore relegate *E. syriaca* Kinberg to the synonymy of *E. complanata* (Pallas). This belated confirmation of Kinberg's record of an *Eurythoë* from this area should put one on guard against a too facile assumption that tropical species newly recorded from the Eastern Mediterranean are immigrants through the Suez Canal, for Kinberg's species was described before the Canal was opened.

Family Syllidæ.

Syllis exilis Gravier.

Fauvel, 1932, p. 77, with citations.

Distribution.—Red Sea, Indian Ocean, Pacific, Eastern Mediterranean.

Remarks.—This tropical species is represented by two specimens. Its special characteristic is the presence in the middle and hinder regions of large curved sickle-shaped end-pieces to the lower bristles. I am of the opinion that *Syllis fuscoturata* Augener, from the West Indies, the Panama region and the Galapagos (v. Monro, 1933, p. 32) is a synonym of this species. Fauvel recorded Gravier's species from the Suez Canal in 1927.

Opisthosyllis brunnea Langerhans.

Fauvel, 1930, p. 15, fig. 2, a-k, with citations.

Distribution.—Madeira, Annobon, Indian Ocean, Eastern Mediterranean.

Remarks.—This species is represented by one specimen, having faint traces of brown banding across the back. Verrill's West Indian *O. nuchalis* is probably a synonym of this species. It has not been found in the Suez Canal.

Family Arietidae.

Scolaricia hazsi, sp. n.

Occurrence.—Between Acre and Jaffa, Palestine. Shore collection (1).

Description.—The single specimen is flattened in the thoracic region and rounded in the abdominal. The latter region is twisted like a pig's tail, and I cannot make an exact measurement. The specimen is incomplete posteriorly, and has about 165 chaetigers: the thorax measures 6 mm. by 2 mm. at the widest part, and the abdominal region is about four times as long as the thoracic.

The prostomium is a sharply pointed cone, and together with the peristomium is equal in length to the first four chaetigers. There are 24 thoracic chaetigers, and the gills begin on the 25th chaetiger. In the anterior thoracic region I can see neither dorsal cirrus nor podial papilla, but in the middle and hinder thoracic regions (fig. 1 a) there is a small truncated dorsal cirrus and a single button-like podial papilla in the middle of the ventral ramus. This podial papilla increases in size, and acquires a slender digitiform shape in the last two or three thoracic segments. There are no subpodial papillae. The neuropodial ridge

appears to be entire and to lack any notch or indentation. The dorsal bristles are crenate capillaries, and the ventral ramus bears crenate capillaries and two to three rows of crochets (fig. 1 b). These crochets are hooded, and under a low magnification have smooth heads, but under a high power delicate transverse grooving becomes apparent on the convex edge of the tip.

In the abdominal region there is a triangular foliaceous gill, an asymmetrical dorsal cirrus shorter than the gill, a lateral organ in the form of a ciliated pad lying between the two rami, and a bilobed ventral ramus with the upper lobe a little longer than the lower (fig. 1 c). There is no ventral cirrus, but its place is taken by a projecting transverse ridge or lobe. The dorsal bristles are crenate capillaries, and I have seen no forked bristles. The ventral bristles are also crenate capillaries, but they differ from the dorsal in having finely tapered ends (fig. 1 d) which are often bent at an angle to the main stem. There is also a slight notch at the base of the tapered portion of the bristle. These are the flail-bristles, the *Geisselpfriemen* of Eisig and *soies en fléau* of Fauvel. The ventral ramus is supported by a pair of rather slender acicula. In spirit there is no colour.

Remarks.—My inability to find a notch dividing the ridge of the thoracic neuropod makes it questionable whether this species is referable to *Scoloplos* or to *Scolaricia*, but as it appears to be closer to *Scolaricia typica* Eisig than to any other form I have referred it to the latter genus. It differs from Eisig's species in the following particulars :—*S. typica* has 19–20 thoracic chaetigers and the gills begin on the 14th–15th ; *S. haasi* has 24 thoracic chaetigers and the gills begin on the 25th. *S. typica* has a well-developed dorsal cirrus in the thoracic region and a notch dividing the thoracic neuropodial ridge into two parts. In *S. haasi* the dorsal cirrus is poorly developed, and, indeed, not discoverable in the anterior thoracic region, and I cannot see a notch dividing the neuropodial ridge. In *S. typica* the podial papilla is dorsal to the neuropod in the hinder thoracic region ; in *S. haasi* it is median. In *S. typica* the heads of the crochets are smooth ; in *S. haasi* they are faintly but distinctly striated.

The present species also shows affinities with *Scoloplos madagascarensis* Fauvel, which has 26–27 thoracic segments

Fig. 1 a.

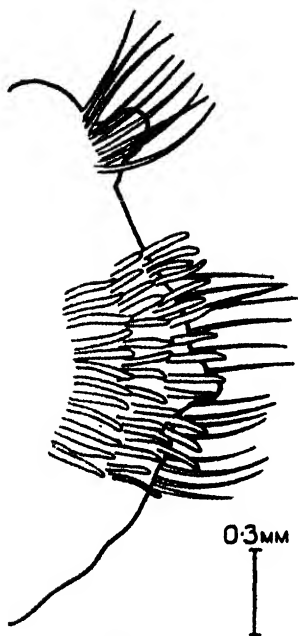
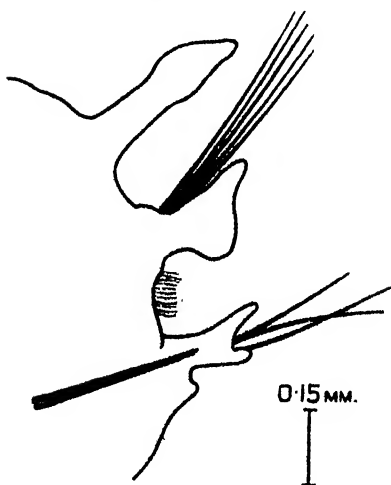


Fig. 1 c.



Soolaricia haasi, sp. n.

Fig. 1 a.—Middle thoracic foot.

Fig. 1 b.—Thoracic hook.

Fig. 1 c.—Abdominal foot.

Fig. 1 d.—Tip of ventral abdominal bristle

Fig. 1 b.



Fig. 1 d.



and the gill beginning on the 21st-22nd chætiger. On the other hand, Fauvel's species has no podial papillæ except on the 25th-27th chætigers; the crochets have no hood or striæ; there is no lateral organ, and there are other points of difference.

Scoloplos johnstoni Moore has 23 to 24 thoracic segments, in which it approaches the present species, but it differs in possessing subpodial papillæ in well-marked rows. *S. treadwelli* Eisig (*Aricia cirrata* Treadwell) has 15-21 thoracic chætigers and the gills beginning on the 13th-17th chætiger, but the presence or absence of podial and subpodial papillæ is not recorded. *S. bustorus* Eisig (*Anthostoma robustum* Verrill) has about 29 thoracic chætigers and the gills begin on the 27th segment, but it possesses subpodial papillæ from about the 25th to the 29th segments.

Family Sabellidæ

Dasychone cingulata Grube.

Augener, 1914, p. 122, with citations.

Distribution.—Red Sea, Indian and Pacific Oceans, Eastern Mediterranean.

Remarks.—This species is represented by ten specimens, all of which show the characteristic peppering with purplish-brown spots all over the body.

REFERENCES.

- AUGENER, H. 1914. Polychæta.—II. Sedentaria. Michaelsen, W., and Hartmeyer, R., 'Die Fauna Südwest-Australiens,' v. pp. 1-170, pl. i., 19 text-figs.
- FAUVEL, P. 1930. "Supplement to the Littoral Fauna of Krusadai Island in the Gulf of Manaar.—Annelida Polychæta." Bull. Madras Govt. Mus. n. s., Nat. Hist. Section, i. (2) pt. 1, 72 pp., 18 text-figs.
- . 1932. "Annelida Polychæta of the Indian Museum, Calcutta." Mem. Indian Mus. xii. (1) pp. 1-262, 9 pls., 40 text-figs.
- KINBERG, J. G. H. 1858. "Nya slågten och arter af Annelider." Öfvers. K. vetensk.-akad. Forhandl. Stockholm, xiv. (1) for 1857, pp. 11-14.
- MONRO, C. C. A. 1933. "The Polychæta Errantia collected by Dr. C. Crossland at Colon, in the Panama Region, and the Galapagos Islands during the Expedition of the S.Y. 'St. George.'" Proc. Zool. Soc. London, (1) pp. 1-96, 36 text-figs.

V.—A new Species of *Omphyma* and some Remarks on the *Pynactis-Phaulactis* Group of Silurian Corals.
By A. J. BUTLER, M.Sc.

[Plates III. & IV.]

THE Holcroft Collection of Silurian fossils, now preserved in the Geological Museum of the University of Birmingham, includes a group of some 180 rugose corals which are named "*Aulacophyllum mitratum*" in the original catalogue of the collection. The corals are all from a locality which is described as "Tunnel under Wren's Nest"; there is no doubt that they were obtained from the Wenlock Shales forming the core of the anticlinal hill of Wren's Nest, near Dudley, where these beds are penetrated by a canal tunnel which runs from the north of Dudley Castle Hill to the limestone shafts on the south-west slope of Wren's Nest.

Investigation of these corals has shown that they can be assigned to the genus *Omphyma* Rafinesque & Clifford, but not to any species hitherto described. They are here described and figured in some detail, firstly because of the contrast which their ontogeny presents with that of existing species of *Omphyma* (this contrast is suggested to be the result of environment), and secondly because of certain suggestive morphological analogies which they present with the *Pynactis-Phaulactis* group of Silurian rugose corals.

NOTES ON NOMENCLATURE.

Drs. Lang and Smith pointed out in 1927 * that the genus *Ptycholopas* Ludwig has priority over *Omphyma* Rafinesque and Clifford; but in a later paper † the same authors have shown good reason for the abolition of all the generic names erected by Ludwig, including *Ptycholopas*.

Professor R. Wedekind ‡ has set up a new classification of the Omphymatidæ in which several new genera are

* "A Critical Revision of the Rugose Corals described by W. Lonsdale in Murchison's 'Silurian System,'" Quart. Journ. Geol. Soc. lxxxiii. pp. 448-491.

† "Ludwig's 'Corallen aus Palæolithischen Formationen,' and the Genotype of *Diephyllum* de Fromental," Ann. & Mag. Nat. Hist. (10) xlii. pp. 78-81 (1924).

‡ "Die Zoantharia Rugosa von Gotland (bes. Nordgotland) etc.," Sveriges Geol. Undersökning, Ser. Ca. no. 19, pp. 1-94, 30 pls.

introduced, but it is difficult to appreciate the validity and identity of these genera and their constituent species from the author's descriptions and figures; in addition, much literature which is relevant to a revision of the *Omphymatidae* has not been taken into account by Wedekind.

Prior to further revision of these corals, on which Dr. H. Dighton Thomas is engaged, the genus *Omphyma* is therefore retained in the present paper. I wish to thank Dr. Thomas for his kindness in reading the typescript of the paper.

Omphyma duplex, sp. n.

(Pl. III. figs. 1-3; Pl. IV. figs. 1-5.)

Holotype.—Holcroft Coll. [V], Geological Museum, University of Birmingham. Wenlock Shale, Tunnel under Wren's Nest, Dudley, Worcs. Collected by William Woodall, 1888.

Diagnosis.—Simple trochoid *Omphyma*, typically curved, which in the ephebic stage usually possess broad flat tabulae and vertically discontinuous septa similar to those of *Omphyma turbinata* Linnæus, though dissepiments are few or absent, but which in brephic and neanic stages, and sometimes throughout ontogeny, possess vertically continuous septa so dilated as to be laterally contiguous and to fill the lumen, and no transverse tissue.

Omphyma duplex, sp. n., var. *obturata* nov.

(Pl. III. fig. 1; Pl. IV. figs. 2, 3.)

Diagnosis.—*Omphyma duplex* in which the septa are vertically continuous and dilated throughout ontogeny, and there is no transverse tissue.

Description.—*External form*: The corallum is simple, trochoid, and usually curved. An average specimen has a length of 50 mm. and is 25 mm. in maximum diameter. The thick epitheca bears well-marked interseptal striae and concentric annulations. The calice is deep, conical, and has its periphery set in Zaphrentoid fashion oblique to the longitudinal axis of the corallum. The floor of the calice is formed by the distal edges of the thick septa, and these edges appear in strong relief. The septa are pinnately arranged around the cardinal fossula, which

is usually occupied by a short cardinal septum (Pl. IV. fig. 3), but in a few exceptional specimens the cardinal septum extends to the axis (Pl. IV. fig. 2). The cardinal fossula is most usually situated on the convex side of the corallum, but may occur on the concave side.

Internal Characters : To avoid repetition it is convenient to describe the early stages of the coral first.

The nepionic and early neanic septa reach the axis, are pinnately arranged around a long cardinal septum, and are so dilated by lateral extension of their primary fibrous tissue as to be laterally contiguous. During ontogeny there is in most individuals a progressive shortening of the cardinal septum until in the ephebic stage it is about one-quarter the length of the other major septa, which remain long throughout ; but this shortening of the cardinal is not a uniform process in all specimens, and, as has been noted above, the cardinal occasionally extends to the axis throughout the life-history of the coral. The extent to which shortening of the cardinal septum proceeds is not correlated with the size of the specimen, as is obvious from Pl. IV. figs. 2, 3. A cycle of minor septa appears after about sixteen or twenty major septa have been inserted, and grow until in the ephebic stage they are about one-third the length of the major septa.

The septa remain dilated and contiguous throughout ontogeny, and completely fill the lumen, so that no tabulae or dissepiments are present (text-figs. 1-3).

Omphyma duplex, sp. n., var. *tabulata* nov.

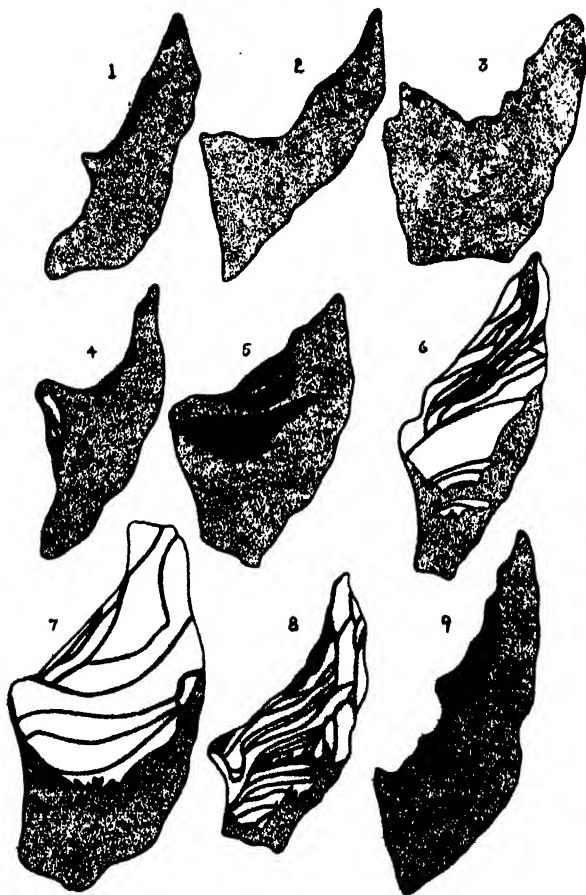
(Pl. III. figs. 2, 3 ; Pl. IV. figs. 1, 4, 5.)

Diagnosis.—*Omphyma duplex* possessing transverse tissue.

Description.—*External characters* : The corals are similar to *O. duplex* var. *obturata* in shape and in average size, but the calice is shallower, and on its slightly concave floor, which is the last-formed tabula, are septal ridges which are much thinner and less strongly sculptured than are the septal edges in the calice of var. *obturata*.

Internal characters : The nepionic and, to a varying extent, the neanic stages of the coral are precisely similar to those of var. *obturata* ; but this "septate" phase is

Text-figs. 1-9.

*Onophyma duplex*, sp. n.

Drawings made from cellulose films, showing the internal structure of nine individuals as seen in longitudinal section. Organic tissue stippled, argillaceous matter adhering to the specimens in full black.

Figs. 1-3.—*O. duplex* var. *obturata*. The lumen is completely filled by the dilated septa and there is no transverse tissue.

Figs. 4-9.—*O. duplex* var. *tabulata*, showing development of transverse tissue in varying degrees of complexity. Fig. 4 represents a specimen with a few dissepiments but no tabulae. Septal ridges on the surfaces of tabulae are prominent in figs. 5, 6, and 8. Fig. 9 represents a worn specimen in which fragments of successive tabulae are exposed (compare Pl. IV. fig. 1).

All nat. size. Figs. 3 and 5-8 are proximally incomplete.

followed abruptly by a phase marked by the development of broad complete tabulæ. These tabulæ are flat, slightly concave, or more rarely slightly convex, and of varying degree of complexity and distance one from another. The septa are not vertically continuous from one tabula to the one above, but are represented by ridges on the surfaces of successive tabulæ. The ridges are tallest ($\frac{1}{2}$ to 1 mm.) at the periphery; towards the axis they thin out and disappear, often becoming spirally involved as they do so (see Pl. IV. figs. 4 and 5, showing the surfaces of tabulæ exposed in two specimens which have been broken across). The cardinal fossula is represented by a trough-like depression at the periphery of each tabula surface.

Dissepiments are few in number or absent. When they occur they are typically coarse and irregular (text-fig. 8). One specimen has been found in which a few dissepiments occur on the concave side of the corallum, although tabulæ are entirely absent (text-fig. 4).

The change from the "septate" or "*obturata*" phase in ontogeny to the "tabulate" phase is not irreversible (see text-fig. 6 and Pl. III. figs. 3 *a-d*, and explanation).

REMARKS.

(a) *Contrast between the Ontogeny of O. obturata and of Omphyma spp. from the Wenlock Limestone.*

A large number of specimens of *Omphyma* from the Wenlock Limestone have been examined, and in every case throughout ontogeny the septa are undilated, vertically discontinuous, and represented by ridges on the surfaces of successive tabulæ. The ontogeny of an individual of *O. turbinata* (Linnaeus) from the Lower Wenlock Limestone of Wren's Nest is shown by the serial section figured on Pl. IV. fig. 7 *a-f*.

In the Wenlock Shale occasional specimens of *Omphyma* have been found which approximate in external habit and in the complexity of the adult transverse tissue to described species such as *O. turbinata*, but in every specimen some development of dilated contiguous septa occurs in early ontogeny.

In the opinion of the writer therefore there is a definite correlation between the shale environment and the develop-

ment of the "septate" condition in *Omphyma*. It is not suggested that *O. obturata* in the Wenlock Shale is directly ancestral to the common Wenlock Limestone species of the genus, but that *O. obturata* exhibits in an advanced degree a morphological modification which is to some extent present in all *Omphyma* from the Wenlock Shale, and which is the result of the conditions prevalent during the deposition of the shale.

In the Wenlock shale of the Birmingham area there is a remarkable absence of the massive reef-building corals which abound in the Wenlock Limestone, and tabulate corals are represented only by small colonies. The commonest rugose corals of the Wenlock Shale are the Calostylidæ—aberrant in habit of growth and in the perforate condition of their septa. Perhaps next in abundance are species of *Acanthocyclus* and *Tryplasma*, and it is worthy of note that these also are characterized by excessive development of calcareous tissue. The even bedding of the shale, the unrolled condition of the fossils, and the frequent occurrence of small corals and specimens of *Lingula* in position of life, perpendicular to the bedding, indicate that wave and current action were at a minimum in the muddy shallow waters. There was no deficiency in the supply of calcium carbonate—this is shown by the frequent calcareous nodules and beds of limestone in the shales—but the muddiness and stillness of the waters near the sea-floor checked luxuriant coral growth; and while simple rugose corals, and in particular those of more primitive habit, could survive, this environment had an inhibiting effect even on these.

In the case of *O. duplex* it appears that the normal growth of the polyp was retarded, particularly in early stages; the periodic upward movements (with intervening stationary periods each represented by a tabular floor bearing septal ridges secreted by the shallow invaginations of the basal ectoderm) by which the polyp growing rapidly under favourable conditions accommodates itself were suppressed. Instead the polyp moved but slowly upwards, so that the septal invaginations were allowed time to secrete vertically continuous septa. The depressing effect of the environment was greatest during early ontogeny; in most cases the adult individual adopted the

normal method of periodic uplift, and tabulæ were secreted ; but the fact that there is often a temporary and occasionally a permanent reversal from a "tabulate" to a "septate" phase shows that this does not imply a change such as the shallowing of the basal invaginations.

At first sight this effect of environment on the morphology of the coral would seem to invalidate the utilization of its ontogeny to provide some indication of its ancestry. In the opinion of the writer, however, the effect of adverse environment can in this case be regarded as a brady-genetic rather than a cœnogenetic modification, and the ontogeny of *O. duplex* suggests the origin of the Omphymatidæ from simple rugose corals of Zaphrentoid habit. A close parallel may be drawn between *Omphyma* in the Silurian and *Caninia* in the Carboniferous.

(b) *Omphyma duplex* and the *Pycnactis-Phaulactis* Group of Rugose Corals.

Three genera of simple rugose corals, *Pycnactis*, *Mesactis*, and *Phaulactis*, were erected in 1926 by Dr. T. A. Ryder *, who regards them as forming a direct lineage which illustrates "three stages in a definite line of development, namely, diminution in secondary thickening." In *Pycnactis* the septa are dilated and laterally contiguous throughout ontogeny ; in *Mesactis* and *Phaulactis* there is a progressive reduction in this dilatation during the life of the coral, beginning at the periphery and extending inwards. *Mesactis*, the intermediate genus of Ryder's lineage, has been discussed by Lang and Smith (*loc. cit.* p. 390), who think that the type and only species, *M. glevenensis* Ryder, should be included in *Phaulactis*.

It may be remarked here that examination of serial sections of *Pycnactis* has shown that the septal insertion is in conformity with the normal plan of insertion in Rugosa, and does not occur at six points, as claimed by Ryder (*loc. cit.* pp. 388-389). Among the specimens I have used for this purpose are some from the red shales of Wenlock age occurring at Whitfield, Gloucestershire, whence Ryder's specimens were obtained. The specimens

* "*Pycnactis*, *Mesactis*, *Phaulactis*, gen. nov., and *Dinophyllum* Lind.," Ann. & Mag. Nat. Hist. (9) xviii. pp. 385-401, pls. ix-xii.

are stained red by infiltration from the shale, and this staining is irregular and does not persist throughout the length of every septum, so that examination under a hand-lens gives a wrong impression of the relative lengths and symmetry of the septa. As in many other rugose genera the two counter-lateral minor septa appear earlier and subsequently grow to a greater length than the other minor septa, and this may produce in the early growth stages a false appearance of septal insertion on either side the counter septum. The work of Miss Vollbrecht * confirms the normality of septal insertion in *Phaulactis*.

The dilated septa of *Pycnactis* and *Phaulactis* are exactly like those of *Omphyma duplex*. In each case the dilatation is produced by lateral extension of the pinnately fibrous septal tissue, and not by deposition of true secondary tissue; *O. duplex* var. *obturata* differs from *Pycnactis mitratus* but slightly in external form and not at all in internal character. Thus there is within the single species *Omphyma duplex* a range of variation closely analogous to the differences regarded by Ryder as generically diagnostic in the *Pycnactis-Phaulactis* group. Certain speculative possibilities are suggested by this analogy:—

(1) While there is no doubt that *Phaulactis* is the descendant of a Pycnactoid ancestor (which itself probably diverged from *Streptelasma*), many or perhaps all of the Salopian specimens now assigned to *Pycnactis* may in reality be young *Phaulactis* in which death has occurred before the onset of reduction of septal dilatation.

(2) The suggestion made in (1) may be valid, but, in addition, the period of retention of dilated septa may have been prolonged in *Pycnactis* as in *Omphyma* by adverse environment. Some support is given to this suggestion by the extreme rarity of *Pycnactis* in the Wenlock Limestone, where *Phaulactis* is one of the most common corals and forms 30 per cent. of the total rugose coral fauna, and by the common occurrence of *Pycnactis* in the Wenlock Shale. It must be remembered that there is little stratigraphical evidence for the *Pycnactis-Phaulactis* lineage. A *Phaulactis* near *P. angusta*, the most advanced species

* "Die Entwicklung des Septalapparates bei *Semaiophyllum*. Ein Beitrag zur Entwicklung des Septalapparates der Rugosen," Neues Jahrb. f. Min. etc., Beil Bd. lxx, Abt. B, 1-30, pls. i.-iv.

of the lineage from the tachygenetical viewpoint, has been recorded from the Valentian *, while *Pycnactis* is not so far known below the Wenlock Shale.

(3) Whether or not these suggestions are well-founded it seems highly probable that *Omphyma* and *Phaulactis* are related genera and have both arisen from the same primitive stock.

A last point, which may have some bearing on the relationship of *Omphyma* with *Pycnactis* and *Phaulactis*, is the occurrence in some specimens of *Phaulactis* of a phenomenon analogous to the differentiation described in the Carboniferous coral *Hettonia fallax* by Hudson and Anderson †, whereby the internal structure of the coral becomes much simplified and broad, flat tabulæ appear.

Serial sections of a *Phaulactis* from the Wenlock Limestone of Dudley showing a similar modification are figured on Pl. IV. figs. 6 a-d. The coral has completely dilated septa in early ontogeny, and this dilatation becomes reduced from the periphery in the usual manner until a typical *Phaulactis* ephebic stage is attained. After this the septa retreat from the axis and simultaneously become vertically and horizontally discontinuous; eventually they are represented by ridges on the surfaces of broad, widely spaced tabulæ. These internal changes, which are accompanied by a constriction in the diameter of the corallum and an abrupt change in direction of growth, produce a strong resemblance to *Omphyma* in sections near the calice.

As in *Hettonia fallax* this modification of structure in *Phaulactis* must be regarded as a gerontic phenomenon ‡; but no other Silurian corals are known in which this *Omphyma*-like condition appears in old age, and it seems possible that its occurrence in *Phaulactis* is connected with the common ancestry of the latter genus and *Omphyma*.

* Smith, S., 1930, "Valentian Corals from Shropshire and Montgomeryshire, with a Note on a new Stromatoporoid," Quart. Journ. Geol. Soc. lxxxvi. pp. 291-330.

† "On the Lower Carboniferous Corals: *Hettonia fallax*, gen. et sp. n.," Proc. Leeds Phil. Soc. 1928, vol. i. part vii. pp. 335-340.

‡ Dr. F. E. S. Alexander (MS., 1934) has described Aymestry Limestone *Phaulactis* in which the condition is far more common than in the *Phaulactis* of the Wenlock Limestone; this suggests advancing senility in the *Phaulactis* stock of the Aymestry Limestone.

EXPLANATION OF THE PLATES.

All the specimens figured here are in the Geological Museum of the University of Birmingham; all the figured specimens of *Omphyma duplex*, which are distinguished by symbols in square brackets, come from the Wenlock Shales, Tunnel under Wren's Nest, Dudley, Worcestershire, were collected by William Woodall in 1888, and form part of the Holcroft Collection preserved in that Museum.

PLATE III.

Figs. 1 a-h. Omphyma duplex, sp. n., var. *obturata* nov. Transverse serial sections, showing the complete ontogeny. The septa are dilated, vertically continuous, and laterally contiguous throughout, except at the stage represented by fig. 1 e, when a few septa are temporarily shortened. [U_1-U_2 , U_3-U_4]. $\times 2$.

Figs. 2 a-c. Omphyma duplex, sp. n., var. *tabulata* nov. Holotype. Transverse sections from a specimen similar in size to that of var. *obturata* figured in figs. 1 a-h. Fig. 2 a marks the end of the "septate" phase, figs. 2 b-c show the "tabulate" ephobic stage. [V_1-V_2]. $\times 2$.

Figs. 3 a-c. Omphyma duplex, sp. n., var. *tabulata* nov. Transverse serial sections, showing the ontogeny of a small specimen in which a "tabulate" phase, beginning in fig. 3 b, and fully developed in fig. 3 c, is again superseded by a "septate" phase, as is evident from fig. 3 d of a section through the calice. Fig. 3 e, an enlargement of a portion of fig. 3 d, shows the pinnate arrangement of the constituent fibres of the dilated septa. [T_1-T_2 , T_3]. Figs. 3 a-d, $\times 2$; fig. 3 e, \times approx. 6.

PLATE IV.

Fig. 1. Omphyma duplex, sp. n., var. *tabulata* nov. External view of a worn specimen, showing the edges of the thick tabulae, the septal ridges on their surfaces, and the trough-like depression representing the cardinal fossula on the convex side of the corallum. [E]. Nat. size.

Fig. 2. Omphyma duplex, sp. n., var. *obturata* nov. External view of a specimen with a long cardinal septum. [796]. Nat. size.

Fig. 3. Omphyma duplex, sp. n., var. *obturata* nov. External view of a small specimen with a short cardinal septum and well-developed fossulae. [770]. Nat. size.

Fig. 4. Omphyma duplex, sp. n., var. *tabulata* nov. A specimen broken to expose the surface of a tabula, showing spinose septal ridges and the axial concavity of the tabula. [C]. Nat. size.

Fig. 5. Omphyma duplex, sp. n., var. *tabulata* nov. A specimen broken to expose the surface of a tabula, showing spiral involution of the septal ridges, with disintegration near the axis. [H]. Nat. size.

Figs. 6 a-d. Phaulactis sp. Transverse serial sections of a specimen, showing gerontic "de-differentiation" (fig. 6 d). Upper part of the Nodular Beds of the Wenlock Limestone; Quarry opposite limekilns, S.W. of Wren's Nest, Dudley, Worcs. $\times 2$.

Figs. 7 a-f. Omphyma turbinata (Linnaeus). Transverse serial sections, showing ontogeny. Lower Wenlock Limestone, S.W. of Wren's Nest, Dudley, Worcs. Nat. size.

VI.—*New Genera and Species of Thysanoptera from South Africa.* By J. DOUGLAS HOOD, Ph.D., University of Rochester, U.S.A.

THREE years ago, at the time of his visit to the United States, Dr. Jacobus C. Faure, of the University of Pretoria, Transvaal, left with me for study the two new genera and five new species which are described below. The new genera were recognized as such by him, and their importance as annectant forms between the Melanthripidae and the Thripodea was fully appreciated. It is thus eminently proper that one should bear his name.

The holotypes—and the allotypes in so far as they exist—remain in the author's collection, while a series of paratypes has been returned to Professor Faure.

Genus FAURIELLA *, nov.

Head about as long as wide and about equal in length to pronotum, all setae minute; cheeks straight and somewhat diverging posteriorly; vertex not elevated, not prolonged, not overhanging; frontal costa rather deeply notched. Eyes not protruding, larger dorsally than ventrally, their facets circular and well separated on dorsum. Ocelli nearly equidistant, the median one smaller than the others. Mouth-cone very short and semicircularly rounded; maxillary palpi three-segmented. Antennae (suggesting those of *Melanthrips*) nine-segmented, without long setae and without terminal stylus, the last four segments successively shorter and narrower; segments iii. and iv. without sense-cones, but with a pale, transverse, linear, and somewhat elevated sense-area extending across ventral surface at extreme apex; v.–viii. each with a ventral sense-cone, v. and vi. each with an additional small sense-cone on outer surface near apex. Pronotum without long setae. Legs rather short and stout; fore femora somewhat enlarged; fore tarsus with a claw-like tooth, as in *Heterothrips* and various *Æolothripoids*. Fore wings narrow, tapering to the slender tip, and with two sparsely setose longitudinal veins; fringing hairs

* Named after Dr. Jacobus C. Faure, of the University of Pretoria, Union of South Africa. This name is not a homonym of *Faurella* Robineau-Desvoidy, 1830. Opinion 25, of the International Commission on Zoological Nomenclature, exactly covers the present case. This opinion holds that *Domecella* and *Damesiella* are not homonyms.

not undulated. Abdomen broader than pterothorax; segment viii. shorter than vii., without comb; x. of normal form, its sides straight and tapering to apex; ovipositor straight, surpassing tip of abdomen, and longer than width of prothorax; all abdominal setæ short and inconspicuous.

Genotype: *Fauriella natalensis*, sp. n.

This genus and the following one have the short mouth-cone, the three-segmented maxillary palpi, the wing-structure, and the fore-tarsal tooth of the Heterothripidae. The antennæ are very much as in *Melanthrips*, even to the arrangement of the sense-cones on segments v.-viii.; and this arrangement is the same as in *Heterothrips*, *Adiheterothrips*, and *Oligothrips*. In the form of the ovipositor, which is straight rather than curved either upward or downward, both *Fauriella* and *Opisthothrips* are intermediate between the *Æolothripoides* and the *Thripoides* (s. l.), though an undoubted member of the latter group.

Fauriella natalensis, sp. n. (Fig. 1 a, b.)

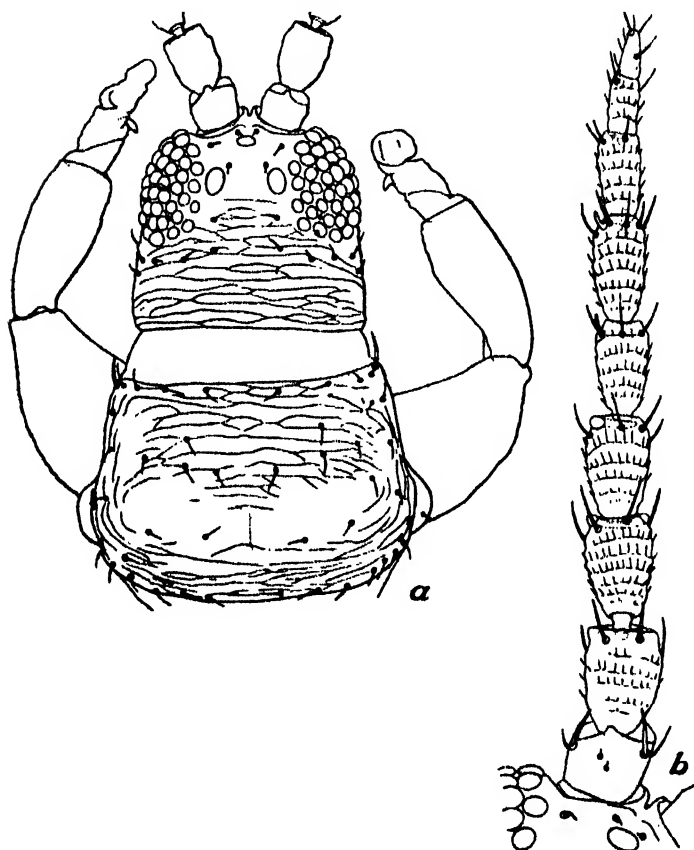
♀ (macropterous).—Length about 1 mm. (fully distended, 1.25 mm.). Colour brown, head and last two abdominal segments always darker, sometimes nearly blackish brown; legs yellow, with the middle and hind femora lightly shaded with brown along the outer (morphologically the upper) surface, and the fore femora similarly but more darkly shaded; antennæ with segment i. brown, about concolorous with abdomen and distinctly paler than head; ii.-iv. yellow or yellowish, ii. usually clouded with brown; v. darker than iv., often yellowish basally, always brown or brownish grey in at least the apical portion; vi.-viii. much darker than v., about concolorous with head, usually blackish brown; wings of fore pair pale brownish yellow, uniform in colour excepting for the somewhat darker veins.

Head (fig. 1 a) about as long as greatest width across cheeks*, its sides almost perfectly straight and slightly

* Posteriorly the head is deepened dorso-ventrally; and this, together with the nearly vertical position of the mouth-cone, results in the almost invariable broadening of the head through the pressure of the cover-glass when specimens are mounted on slides. In the present description and measurements the true form and proportions of the head are given. Unless the specimen has been mounted with extreme care, the width of the head across its posterior margin is about 1.2 times its median dorsal length.

diverging posteriorly; vertex not elevated, not prolonged, not overhanging; frontal costa with a deep notch; surface with distinct, dark, rather widely-spaced, anastomosing, transverse striæ and a number of minute setæ,

Fig. 1.



Fauriella natalensis, gen. et sp. n., ♀. a, head and prothorax, paratype (all setae omitted from appendages). b, left antenna, paratype.

all well shown in the accompanying figure. *Eyes* not protruding laterally, composed of well-separated round facets, their dorsal length about 0.52 that of head, their ventral length 0.4 that of head, their measurements as follows, in μ , in one paratype: dorsal length 59, width 33,

interval 43, ventral length 45, width 26, interval 57. *Ocelli* of posterior pair about $13\ \mu$ in diameter, $22\ \mu$ apart, and $17\ \mu$ from median ocellus, the latter about $9\ \mu$ in diameter and situated shortly behind the line of anterior margin of eyes; posterior ocelli with their centres somewhat in advance of middle of eyes. *Antennæ* (fig. 1 b) with nine distinct segments. *Mouth-cone* very short, broadly rounded at apex.

Prothorax (fig. 1 a) about equal in length to head and about 1.45 times as broad as long, its sculpture and chætotaxy well shown in figure. *Legs* rather short and stout, the fore femora about $112\ \mu$ long and $67\ \mu$ wide, the fore tibiæ $82\ \mu$ long and $35\ \mu$ wide. *Fore wings* about $630\ \mu$ long and $50\ \mu$ wide at middle; costal margin with about 28 pale setæ, which are much shorter and very much more widely spaced in proximal part of wing; anterior vein with a subbasal group of about 3 short pale setæ followed by a more widely spaced group of 3 and then by 4 in distal half of wing; posterior vein with about five equally spaced setæ, the first of which arises just distad of the cross-vein which connects the two longitudinal veins near basal third of wing.

Abdomen about 1.3 times as broad as pterothorax, its more basal terga with a few transverse anastomosing lines which are much weaker than those on head and more distinct laterally; tergum ix. nearly smooth, with a few extremely faint lines across base; terga ii.-vi. with a few (1-5) microtrichia at extreme sides of posterior margin; viii. without comb; setæ on terga of segments i.-viii. minute, less than $30\ \mu$ in length, those on ix. only $43\ \mu$; ovipositor about $188\ \mu$.

Measurements of ♀ (paratype), in mm.: length about 0.95 (fully distended, 1.25); head, length 0.113, width across eyes 0.110, greatest width across cheeks 0.115; prothorax, median length of pronotum 0.110, greatest width 0.160; mesothorax, greatest width 0.219; metathorax, greatest width 0.209; abdomen, greatest width 0.277, median length of tergum vii. 0.062, viii. 0.047.

Antennal segments.	1.	2.	3.	4.	5.	6.	7.	8.	9.
Length (μ)	17	32	36	33	30	34	27	18	12
Width (μ)	24	24	20	18	16	16	13	9	6

Total length of antenna 0.239 mm.

NATAL: Ndumu, September 22 and 23, 1922, "in flowers of tree like *Rhus*" (Dr. J. C. Faure), 14 ♀♀ (Faure no. T. 50].

The closest and only near relative of the present species is the one described immediately below. The number of segments in the antennæ, the size of the ovipositor, the form of the tip of the abdomen, and the sculpture of the ninth abdominal tergum will serve to separate them readily.

Genus *OPISTHOTHrips*, nov.*.

Head about as long as wide and about equal in length to pronotum, all setæ minute; cheeks straight and somewhat diverging posteriorly; vertex not elevated, not prolonged, not overhanging; frontal costa rather deeply notched. Eyes not protruding, larger dorsally than ventrally, their facets circular and well separated on dorsum. Ocelli nearly equidistant, the median one smaller than the others. Mouth-cone very short and semi-circularly rounded; maxillary palpi three-segmented. Antennæ (suggesting those of *Melanthrips*) eight-segmented, without long setæ and without terminal stylus; segments iii. and iv. without sense-cones, but with a pale, transverse, linear, and somewhat elevated sense-area extending across ventral surface at extreme apex; v.-viii. each with a ventral sense-cone, v. and vi. each with an additional small sense-cone on outer surface near apex. Pronotum without long setæ. Legs rather short and stout; fore femora somewhat enlarged; fore tarsus with a claw-like tooth, as in *Heterothrips* and various *Æolothripoids*. Fore wings narrow, tapering to the slender tip, and with two sparsely setose longitudinal veins; fringing hairs not undulated. Abdomen broader than pterothorax; segment viii. equal in length to vii., without comb; x. very short, its sides rounded and not at all tapering to apex; ovipositor straight, not reaching tip of abdomen, and much shorter than width of prothorax; all abdominal setæ short and inconspicuous.

Genotype: *Opisthothrips elytropappi*, sp. n.

This genus is most closely related to *Fauriella*, described immediately above, and is to be looked upon as a more

* *ὀπισθεν*, behind; *επιψ*, a wood-worm—in allusion to the highly characteristic posterior end of the abdomen, with its reduced ovipositor.

specialized form of the same general type. The eight-segmented condition of the antennæ is clearly the result of the union of the two terminal segments. The great reduction in the size of the ovipositor has produced a corresponding reduction in the lengths of the apical abdominal segments, as well as a weakening of the integument in that region; and the tip of the abdomen itself has become rounded, much as in *Plesiothrips*.

Opisthothrips elytropappi, sp. n.

(Fig. 2 a, b.)

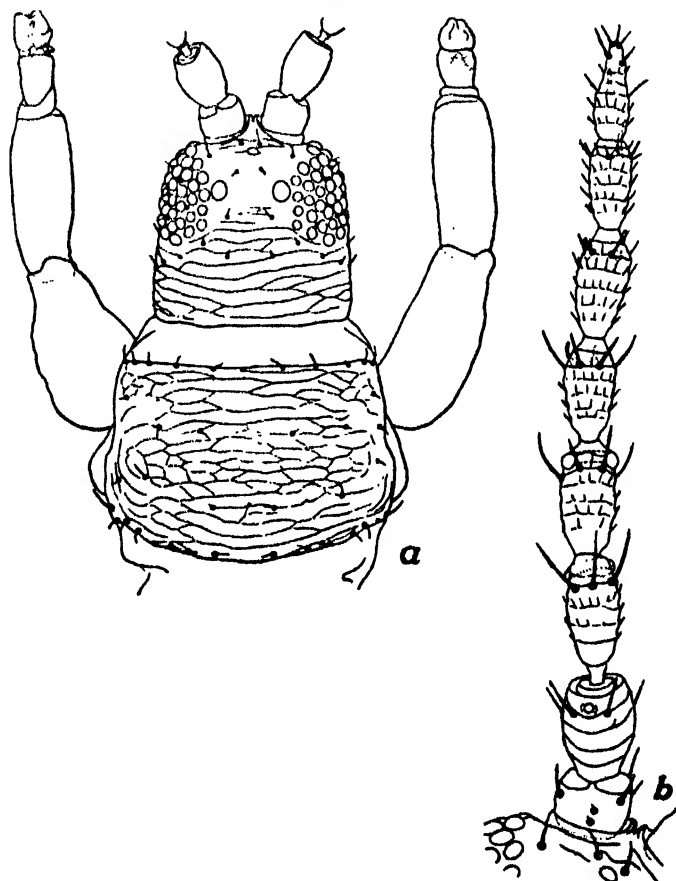
♀ (macropterous).—Length about 0.8 mm. (fully distended, 1.2 mm.). Colour brown, head always darker, usually nearly blackish brown; legs brown, with tarsi and distal ends of tibiæ paler, fore femora nearly blackish brown along the outer (morphologically the upper) surface; antennæ with segments i. and ii. brown, about concolorous with abdomen and distinctly paler than head, the apex of ii. brownish yellow, iii. with pedicel concolorous with apex of ii. and lightly infuscate beyond, iv.—viii. darkest, uniform blackish brown or with iv. somewhat paler; wings of fore pair pale brownish yellow, uniform in colour excepting for the somewhat darker veins and a small colourless median spot just beyond scale.

Head (fig. 2 a) about as long as greatest width across cheeks*, its sides almost perfectly straight and slightly diverging posteriorly; vertex not elevated, not prolonged, not overhanging; frontal costa with a deep notch; surface with distinct, dark, rather widely spaced, anastomosing, transverse striæ and a number of minute setæ, all well shown in the accompanying figure. *Eyes* not protruding laterally, composed of well-separated round facets, their dorsal length just one-half that of head, their ventral length about 0.37 that of head, their measurements as follows, in μ , in one paratype: dorsal length 52, width 26, interval 42, ventral length 38, width 23, interval 50. Ocelli of posterior pair about 10μ in diameter, 22μ apart, and 17μ from median ocellus, the latter about 6μ in diameter, and situated shortly behind the line of anterior margin of eyes; posterior ocelli with their centres

* The foregoing footnote, under *Fauriella natalensis*, applies equally to the present species.

about opposite middle of eyes. *Antennæ* (fig. 2 b) with eight segments only, the terminal one being formed by the union of viii. and ix. *Mouth-cone* very short, broadly rounded at apex.

Fig. 2.



Opisthothrips elytrapippi, gen. et sp. n., ♀. a, head and prothorax, paratype (all setae omitted from appendages). b, left antenna, paratype.

Prothorax (fig. 2 a) about equal in length to head and about 1.5 times as broad as long, its sculpture and chaetotaxy well shown in figure. *Legs* rather short and stout, the fore femora about $106\ \mu$ long and $59\ \mu$ wide, the fore

tibiæ 97 μ long and 36 μ wide. *Fore wings* about 672 μ long and 43 μ wide at middle; costal margin with about 21 pale setæ, which are much shorter and very much more widely spaced in proximal part of wing; anterior vein with a subbasal group of 2 or 3 short pale setæ followed by 2 or 3 others in proximal third of wing, and then by 3 or 4 equally-spaced ones in distal two-thirds; posterior vein with 3 equally-spaced setæ, the first of which arises just distad of the cross-vein which connects the two longitudinal veins near basal third of wing.

Abdomen about 1.25 times as broad as pterothorax; terga i.-vii. with transverse anastomosing lines which are weaker and paler than those on head and somewhat asperate on vi. and vii.; viii. (and sometimes vii.) lightly subreticulate medially, viii. at sides with several lines of sculpture which nearly parallel the lateral margins; ix. *longitudinally* striate throughout; x. smooth; posterior margins without microtrichia or comb; setæ on terga of segments i.-viii. minute, less than 18 μ in length, those on ix. only 21 μ ; ovipositor exceedingly short, only about 92 μ .

Measurements of ♀ (paratype), in mm.: length about 0.84 (fully distended, 1.19); head, length 0.104, width across eyes 0.095, greatest width across cheeks 0.099; prothorax, median length of pronotum 0.097, greatest width 0.145; mesothorax, greatest width 0.190; metathorax, greatest width 0.180; abdomen, greatest width 0.238, median length of tergum vii. 0.047, viii. 0.047, ix. 0.057, x. 0.024.

Antennal segments.	1.	2.	3.	4.	5.	6.	7.	8.
Length (μ)	17	31	36	31	27	28	25	30
Width (μ)	23	22	16	17	15	15	13	11

Total length of antenna 0.225 mm.

♂ (macropterous).—Length about 0.8 mm. (fully distended, 1.02 mm.). Colour and structure almost identical with that of female; antennæ a trifle slenderer; sculpture of abdominal terga less distinct, that on ix. very faint and *transverse*; posterior margins of terga i.-vii. of abdomen with a few minute microtrichia at sides; sterna vii. and viii. each with a narrow transverse glandular area at middle, each about 2–3 μ wide and about 70 μ and 60 μ long, respectively; tip of abdomen without clasping organs or other special chitinous processes.

Measurements of ♂ (paratype), in mm.: length about 0.81 (fully distended, 1.02); head, length 0.108, width across eyes 0.097, greatest width across cheeks 0.102; eyes, dorsal length 0.053, dorsal width 0.028, dorsal interval 0.041, ventral length 0.045, ventral width 0.025, ventral interval 0.048; median ocellus, diameter 0.009; posterior ocelli, diameter 0.012, interval 0.022, distance from median ocellus 0.016; mouth-cone, length beyond dorsal margin of head, 0.050; prothorax, median length of pronotum 0.103, greatest width 0.160; mesothorax, greatest width 0.200; metathorax, greatest width 0.183; abdomen, greatest width 0.210.

Antennal segments.	1.	2.	3.	4.	5.	6.	7.	8.
Length (μ)	17	31	40	34	28	30	26	31
Width (μ)	24	22	16	17	15	15	13	11

Total length of antenna 0.237 mm.

CAPE PROVINCE: Grahamstown, April 21, 1927, on *Elytropappus rhinocerotis* (Dr. J. C. Faure), 16 ♀♀, 5 ♂♂ [Faure no. T. 48].

Hercinothrips dimidiatus, sp. n.

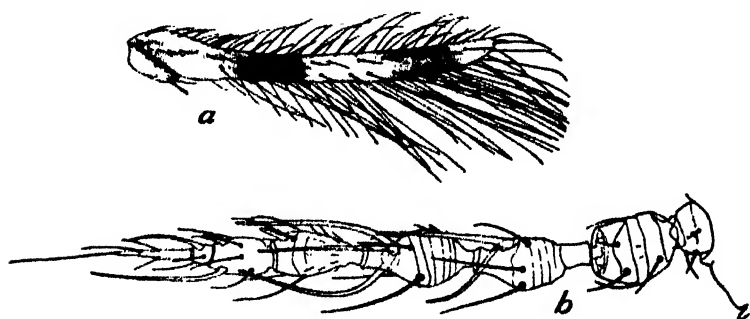
(Fig. 3 a.)

♀ (macropterous).—Length about 1.25 mm. *Bicolorous*, the head, prothorax, and pterothorax yellow, usually shaded with brownish laterally, but always abruptly paler than the abdomen, which is deep brown in segments ii.–vi. and yellow or yellowish beyond, with the lateral portions of vii. lightly, and of viii. and ix. more darkly, shaded with brown, x. yellow in basal half or more and usually rather abruptly dark brown in apical portion, but occasionally wholly pale; legs yellow, with tibiae, and especially the tarsi, paler, the middle femora darkest and distinctly shaded with brownish, the fore femora and tibiae, and often the middle tibiae, but never the hind femora, lightly shaded; fore wings (fig. 3 a) pale, with two dark cross-bands, which are about equal in width to each other and to the pale space between them, the first occupying about the second fourth of the wing, the other near tip; antennae largely yellow, segment ii. always darker than i. and iii. and often lightly shaded, iii.–v. with pedicels pale yellowish and their apices deep yellow and successively darker, vi. yellow in about basal

two-thirds, its remainder and all of vii. and viii. deep greyish brown; ocellar pigmentation bright vermilion.

Head about 1.7 times as wide as long, somewhat broader across cheeks than across eyes; dorsal surface lightly reticulate as in the other species of the genus, and, like them, with an indistinct occipital line which becomes elevated at cheeks to produce a distinct groove between itself and posterior margin of head; cheeks arched and slightly converging posteriorly. *Eyes* thoroughly typical, two-thirds as long as head (77μ) and rounded, their width about 51μ , their interval 92μ , somewhat shorter on ventral surface of head. *Ocelli* borne on the usual slight prominence, the posterior pair about 17μ in diameter and 30μ apart. *Antennæ* about 1.65 times as

Fig. 3.



a, *Hercinothrips dimidiatus*, sp. n., ♀, right fore wing, holotype.
b, *Helionothrips stephanix*, sp. n., ♀, right antenna, paratype.

long as width of head across eyes, formed as in the genotype; segments iii. with Y-shaped, and iv. with V- or U-shaped, sense-cone.

Prothorax of typical form and structure, shorter than head, more than twice as wide as median length, with a transverse chitinous line in front of posterior margin, and with about ten pairs of setae in addition to those on posterior margin; middle pair of setae on anterior and posterior margins both about 28μ . *Pterothorax* normal, metanotum with its median area not differentiated to form a somewhat elevated scutellum with overhanging lateral margins. *Wings* typical, the fore pair (fig. 3, a) distinctively coloured as described above; costa with 20-22 strong setae and about 25 fringing hairs; anterior

vein with a basal group of four setæ followed by about 13, those toward apex of wing somewhat more widely spaced; posterior vein with about 10 setæ; all wing-setæ dark brown in the dark areas of the wing and pale yellow in the light areas. *Legs* normal to the genus.

Abdomen of the usual form, its sculpture and chaetotaxy as in the genotype, except that terga ii.-vi. are provided with microtrichia on their lateral portions.

Measurements of ♀ (holotype), in mm.: length 1.25; head, median dorsal length 0.115, width across eyes 0.193, greatest width across cheeks 0.195, least width near base 0.187; mouth-cone, length beyond dorsal margin of head 0.122; prothorax, median length of pronotum 0.100, width 0.235; mesothorax, greatest width 0.316; metathorax, greatest width 0.301; fore wings, length 0.794; abdomen, greatest width 0.413.

Antennal segments.	1.	2.	3.	4.	5.	6.	7.	8.
Length (μ)	24	43	70	50	42	33	16	40
Width (μ)	31	34	24	22	23	21	11	6

Total length of antenna 0.318 mm.

Male (macropterous).—Length about 0.97 mm. Colour yellow, the head and thorax very lightly shaded at extreme sides, the abdomen orange-yellow; wings and antennæ coloured as in female; terga ii.-vi. with microtrichia at sides; tergum ix. with two pairs of strong thorn-like setæ arising from elevated tubercles, the upper pair and their tubercles larger and brown in colour, the lower pair slightly more posterior in position and yellowish; a third pair lateral to these and at a still lower level, much more slender and more pointed.

ORANGE FREE STATE (Union of South Africa): Bloemfontein, March 21 and April 23, 1930, on pot-plants and an undetermined liliaceous plant, respectively (*Dr. J. C. Faure*), 7 ♀♀, 2 ♂♂. One male from the Transvaal (Rosslyn, Pretoria, March 25, 1919, on pea, *Dr. Faure*) is doubtless of this species, agreeing with it in the presence of microtrichia on the second to sixth abdominal terga and in the colour of the wings and body, but I have excluded it from the type-series because the fourth antennal segment is slightly, and the fifth darkly, infuscate apically, and the second pair of strong setæ on the ninth abdominal tergum, and the tubercles from which they arise, are brown instead of yellow.

H. femoralis (Reuter) (= *Heliothrips cestri* Pergande), of which I have authentic material from Reuter himself, is readily distinguished from this and the other species of the genus by the darker fore wings, the distinctly wrinkled reticles of the head and thorax, the Y-shaped trichomes on the third and fourth antennal segments, and by the presence of a dense hair-like covering of microtrichia on the lateral portions of the second abdominal tergum only. *H. bicinctus* (Bagnall) differs in having the head and thorax dark blackish brown at the sides, the dark cross-bands of the fore wings much narrower than the pale band between them, a distinctly differentiated scutellum occupying the median portion of the metanotum, and the second to fourth abdominal terga provided laterally with microtrichia. *H. pattersoni* (Bagnall), the genotype and its closest relative, of which I have cotypic specimens, agrees with *dimidiatus* in the disposition of the abdominal microtrichia; but the head and pterothorax are brown (much darker than the prothorax and thus with no division of the body into a pale anterior, and a dark posterior, part), the trichome on the third antennal segment is V, rather than Y, shaped, and the pronotum bears twelve pairs of setæ, exclusive of those on the posterior margin, instead of ten.

Helionothrips stephaniæ, sp. n.
(Fig. 3 b.)

♀ (macropterous).—Length about 1.2 mm. Colour blackish brown, with last three abdominal segments somewhat paler, the head not yellowish anteriorly; all coxæ concolorous with body, all trochanters and tarsi bright lemon-yellow; fore femora brown in about basal half, yellow beyond, darkened with blackish brown along most of outer (morphologically the upper) surface, their tibiæ lemon-yellow, but shaded with brown along the morphological upper and lower surfaces except in the narrow basal portion; middle and hind femora briefly yellow at extreme base and concolorous with body beyond, thus much darker than fore femora, their tibiæ blackish brown in basal half and clear yellow in apical half; fore wings brown, darker in basal sixth (including scale) and for a short distance beyond a white band which occupies the remainder of the basal fourth of wing, with

a second white band at about apical seven-eighths, the intervening brown portion paler in about middle third; antennæ with segments i.-v. lemon-yellow, vii.-viii. brown or blackish brown, the extremes base of vi. often yellowish.

Head (when not tipped downwards) about 1.63 times as wide as long, broadest across cheeks behind eyes, nearly as broad across the strongly projecting occipital line; cheeksswollen, curving to eyes, converging posteriorly, then flaring slightly to occipital line, abruptly constricted behind the latter to form a narrow neck whose greatest width is only 0.81 that across cheeks, the occipital line thus elevated and prominent; ocellar area elevated; front of head sloping nearly evenly downward to frontal costa, the latter 38μ wide and broader than second antennal segment; chaetotaxy and sculpture as in genotype; setæ near inner margins of eyes curving over median ocellus, 45μ long, the pair behind the posterior ocelli only 13μ . *Eyes* much more than one-half the length of head, measuring in μ as follows in one paratype: dorsal length 77, width 49, interval 91. *Ocelli* of both pairs about 18μ in diameter, the posterior ones 33μ apart and 19μ from median ocellus. *Antennæ* about 1.5 times as long as greatest width of head, their structure well shown in figure (fig. 3 b); outer arm of forked sense-cone on segment iv. about 73μ . *Mouth-cone* short, thoroughly typical of the genus.

Prothorax with its lateral margins flat and shelf-like in anterior half, its sides rounded to anterior angles, broadest just behind the latter, the portion behind the widest part forming a semicircle, anterior margin straight, its greatest width twice its median length; surface distinctly reticulate with dark lines and with a broad fovea on each side not far from margin; its setæ short (28μ), pale, and curved. *Meso- and metanota* distinctly sculptured, the anterior plate of metanotum with a differentiated triangular scutellum, the posterior plate about 127μ wide and 37μ long. *Legs* normal to the genus. *Fore wings* about 4.5 times as long as greatest width of head and 18 times their width at middle, form and venation as in genotype; costal margin with about 23 setæ (those at middle of wing about 30μ) and about 26 fringing hairs; anterior vein with 3 or 4 dark setæ

in the dark area at base of wing, 1 colourless seta in the distal portion of the succeeding white band, 2 dark stout ones close together in the dark area just beyond, 1 white seta in the subapical white band, and a dark one, somewhat more posterior in position, near tip; posterior vein with 4 setae in the long dark cross-band, the two distal ones usually darker and closer together.

Abdomen of normal form, somewhat narrowed basally, broadest at segment iv., strongly sculptured above; basal line on terga iii.-vii. each with a median and three lateral scallops, the median one in each case subtending an ellipse whose distal half is indistinct and whose axis is longitudinal.

Measurements of ♀ (paratype), in mm.*: length about 1.16 (distended, 1.4); head, median dorsal length 0.120, width across eyes 0.189, greatest width across cheeks 0.195, width at occipital line 0.192, width across basal collar 0.158, distance from occipital line to base of head 0.035; prothorax, median length of pronotum 0.133, greatest width 0.272; mesothorax, greatest width 0.318, metathorax, greatest width 0.287; fore wings, length 0.868, width at middle 0.048; abdomen, greatest width 0.335.

Antennal segments.	1.	2.	3.	4.	5.	6.	7.	8.
Length (μ)	24	43	61	55	41	30	11	32
Width (μ)	25	33	26	29	22	18	9	5

Total length of antenna 0.297 mm.

TRANSVAAL: Woodbush (Pietersburg), April 17, 1924, on *Stephania meyeriana* Haw. (Dr. J. C. Faure), 11 ♀♀.

The coloration of the wings and antennae separates it from all of its congeners excepting *crassus*, which is described below; and from that species it may readily be known by the form of the posterior metanotal sclerite and the abdominal sculpture.

Helionothrips crassus, sp. n.

♀ (macropterous).—Length about 0.9 mm. Colour of head and thorax dark brown, of abdomen light brown, the head not yellowish anteriorly; all coxae concolorous

* This specimen, after treatment with sodium hydroxide, was mounted with its head horizontal—that is, with its posterior margin forming a nearly straight line when observed from above—and in such a manner as to float in the balsam free of any cover-glass pressure.

with body, all tarsi bright lemon-yellow, all trochanters pale; fore femora and tibiae yellow, obscurely shaded with brown; middle and hind femora dark brown (perhaps paler at extreme base); middle tibiae brown in basal half or less and rather abruptly pale yellow beyond; hind tibiae paler than middle tibiae, light brown basally and shading to pale yellow in about apical two-fifths; fore wings dark brown, darker in basal sixth (including scale), with a white cross-band occupying the remainder of basal third of wing and another white band in the fourteenth fifteenth, the intervening brown portion slightly darker basally; antennae with segments i.-v. yellow, the two basal ones lightly shaded with brown basally, vi. yellow basally, shading to brown in distal half, vii. and viii. brown.

Head very short, probably about twice as wide as long when not tipped downward, broadest across cheeks behind eyes at the level of the occipital line; cheeks swollen, converging to eyes, abruptly constricted behind the occipital line to form a narrow neck, the occipital line thus elevated and prominent; ocellar area elevated; front of head sloping nearly evenly downward to frontal costa, the latter about 30μ wide and equal in width to second antennal segment; chaetotaxy and sculpture as in genotype, except that the setae which are usually situated near inner margins of eyes are on the edges of the ocellar elevation and are only 18μ in length, the pair behind the posterior ocelli minute. *Eyes* 47μ wide, their interval 75μ . *Ocelli* of both pairs about 15μ in diameter, the posterior ones 39μ apart and 19μ from median ocellus. *Antennae* about 1.33 times as long as greatest width of head, of the same general structure as in *H. stephaniae*, but with segments iii.-vi. notably shorter and relatively stouter, and the sense-cones and setae much shorter, the outer arm of the forked sense-cone on iv. only 34μ . *Mouth-cone* short, thoroughly typical of the genus.

Prothorax with its lateral margins flat and shelf-like in anterior half, its sides rounded to anterior angles, its posterior margin broadly arcuate, its greatest width about 1.9 times its median length; surface distinctly reticulate with dark lines and with a broad fovea on each side behind middle, its setae short (21μ), pale, and curved.

Meso- and *metanota* distinctly sculptured, the anterior plate of metanotum with a differentiated triangular scutellum, the posterior plate about 146μ wide and only 24μ long. *Legs* slightly more slender, but not longer, than is usual in the genus, the hind femora about 36μ wide. *Fore wings* about 4.1 times as long as greatest width of head and approximately 15 times their width at middle, form and venation as in genotype; costal margin with 24–26 setæ (those at middle of wing stout and only 15μ long) and about 28 fringing hairs; anterior vein with four dark setæ in the dark area at base of wing (the distal one larger, darker, and prominent), 1 colourless seta in the distal portion of the succeeding white band, 2 prominent and very dark ones close together in the dark area just beyond, 1 pale brown one just before the subapical white band, and a fourth prominent dark one close to apex of wing; posterior vein with 4 dark setæ nearly evenly spaced in the long brown cross-band.

Abdomen of normal form, somewhat narrowed basally, broadest in segments iii. and iv., strongly sculptured above; basal line on terga iii.–vii. each with a median and three lateral scallops, the median one in each case marking off the base of a slightly sculptured area which is broader basally, indistinct apically, and not elliptical in form.

Measurements of ♀ (holotype), in mm.: length about 0.92; head, median length 0.086, width across eyes 0.169, greatest width across cheeks 0.174; prothorax, median length of pronotum 0.112, greatest width 0.218; mesothorax, greatest width 0.315; abdomen, greatest width 0.329.

Antennal segments.	1.	2.	3.	4.	5.	6.	7.	8.
Length (μ)	21	38	49	40	31	24	7	21
Width (μ)	22	31	26	27	21	18	8	4

Total length of antenna 0.231 mm.

TRANSVAAL: Acornhoek (Lydenburg), July 19, 1927, on *Acacia* foliage, 1 ♀ (*holotype*); Sekororo Loc (Pietersburg), July 16, 1927, on *Cæsalpinia sepiaria*, 1 ♀ (*paratype*); both specimens collected by Dr. J. C. Faure.

In this species the posterior sclerite of the metanotum is about six times as wide as long, while in the allied *H. stephanizæ* the proportions are much less than four to

one. The antennal segments, as well as their sense-cones and setæ, are shorter in the present species; the abdomen is differently sculptured; the distal white band on the fore wings is narrower and closer to the wing-tip; and the wing-setæ, especially those on the costal margin, are much shorter.

VII.—*On the Freshwater Idoteidæ of New Zealand*
(Crustacea, Isopoda). By G. E. NICHOLLS, D.Sc.,
Professor of Biology, University of West Australia.

INTRODUCTION.

During the summer of 1935/6 the writer made a lengthy collecting trip through the southern part of the South Island of New Zealand, the primary object being a search for possible surface-water Phreatoicids.

In the course of that search two quite distinct freshwater Idoteids were obtained, one (associated with several Gammarids, including *Apocrangonyx* sp., and a Phreatoicid) being found on Stewart Island, almost at sea-level. Of the second only a single specimen was secured, this being taken from a mud-filled hollow in the gorge * through which flows the Ross Creek.

The existence of a freshwater Idoteid in New Zealand has long been known, a species having been recorded, under the name of *Idotea lacustris*, by G. M. Thomson (1879), who believed it to be the only known freshwater member of this group †. Originally it was taken in the small Tomahawk Lagoon, near Dunedin, which is commonly regarded as fresh water. This receives the drainage of two or three small springs, but is separated from the sea only by a sand-bar, and is, almost certainly, liable to occasional irruptions of the sea. Indeed, Thomson

* This locality is at a considerable height above sea-level, the creek receiving the overflow of the reservoir and discharging into the Leith River at Woodhaugh. No trace of a Phreatoicid could here be found, although one was recorded from Woodhaugh some thirty years ago, but a few specimens of *Phreatogammarus* were found nearby.

† *Mesidotea entomon* is another freshwater form recorded from deep water in Lake Vetter in Sweden and from the Baltic at Stockholm. Elsewhere this form has been recorded as circumpolar and extending in the Pacific as far south as Puget Sound and the coast of California. *Synidotea hirtipes* has been taken from brackish water in the Cameroon.

remarked of his specimens (1879, p. 250):—"Whether they occur permanently in the fresh water, or only come up when a high tide renders communication with the lagoon possible, I cannot say."

Subsequently Miers (1881 *a*), with considerable hesitation, referred specimens taken at Magellan ("probably marine") to Thomson's species. Miers gave a small *habitus* figure (*l. c.* pl. i. fig. 11), but no description, and suggested that if this South American species should prove to be distinct the specific name *rotundicauda* would be suitable. In a paper appearing slightly earlier in the same year (1881) Miers had assigned these same specimens (from Port Henry) to *Idotea annulata* Dana.

The very brief description given by Thomson was supplemented by Chilton (1890, 1891, 1892, 1909), and in the three later of these papers there was recorded the occurrence of specimens referred to *I. lacustris* G. M. T. from numerous localities, for the most part in running water, unquestionably fresh and high above the sea.

The specimens taken at these higher levels were said to show "numerous small differences" from the typical form taken in Tomahawk Lagoon, the latter being distinguished as variety α , and the former regarded as constituting a new variety β . Chilton makes the suggestion that the typical *I. lacustris* was a rather unspecialized form of marine origin which had been trapped in this lagoon (which subsequently became fresh water), and there, preserved from competition, had survived, to give rise in the course of time to the purely freshwater variety.

In Dunedin, through the kindness of Professor Benham, the writer was able to compare his specimens, taken on Stewart Island, with others from the type-locality. A very cursory examination, all that was possible at the time, was sufficient to determine that they were unquestionably distinct.

Opportunity for a more thorough investigation was afforded when, during a short stay at Millport (Scotland), the writer was permitted to occupy a table in the Biological Station there. The results of that examination were somewhat unexpected, the preparations revealing that neither form could be referred to the genus *Idotea*, but both were closely akin to *Glyptonotus* and *Mesidotea*. To neither of these genera, however, can these New Zealand specimens be assigned, and it becomes necessary

therefore to establish for their reception a new genus *, for which the name *Austridotea* is proposed. It must be placed in the subfamily Mesidoteinæ Racovitza and Sevastos, although in at least one character it transgresses the boundaries of that subfamily and, in several, it links up with *Glyptonotus*.

The writer desires to take this opportunity of acknowledging his indebtedness to the Trustees of the (Australian) Science and Industry Endowment Fund for a grant which made possible the undertaking of so extended a trip; and to express his thanks also to Professor Benham for much kindly help as well as the gift of material; to Mr. Elmhirst, Director of the Biological Station, Millport, for permission to occupy a table in the laboratory there; to Dr. Stephen, Keeper of Zoology in the Royal Scottish Museum, who made available for study material of *Glyptonotus* and *Mesidotea*; and to Dr. Gordon, of the British Museum, for facilitating the examination of numerous Idoteids in that collection, including the types of *Idotea rotundicauda* Miers, and also seeing this paper through the press; lastly, thanks are due to Dr. Aubrey Nicholls for many of the figures.

Family Idoteidæ.

Subfamily MESIDOTEINÆ Rac. & Sev.

The definition of this subfamily, if it is to include *Austridotea*, requires one modification. The description of the pleon should read:—"montrant trois ou quatre pléonites dont au moins les I et II sont libres" (Racovitza & Sevastos, 1910, p. 194).

AUSTRIDOTEA, gen. nov.

Body depressed, ovate; head widest behind the eyes, its antero- and postero-lateral margins produced into lobes meeting in an obtuse angle against the eyes, dorsally the sinuous transverse furrow strongly marked; eyes appearing dorsal, submarginal, also distinctly visible on the ventral surface as faceted areas; second antennæ with multi-articulate flagellum, with no marked setosity in the ♂; lateral border of first peræon segment extending well forwards on either side of the head; peræon segments 2-7 with coxal plates distinct; pleon narrowing posteriorly,

* See Addendum

with but two free segments, the third incompletely separated from the succeeding pleo-telson by a pair of deep incisures. Palp of maxilliped with five distinct joints; peræopods divided into two groups, I.-III. subchelate, IV.-VII. simple ambulatory; second pleopod in the ♂ with appendix masculina extremely long, reaching almost to the hind end of the body. Uropods (opercula) with strong lateral setose spine and retaining both rami.

Remarks.—The flattened ovate body, the broadened depressed head, widest posteriorly, produced into lateral lobes and marked by a transverse furrow, the forwardly produced antero-lateral angles of the first peræon segment, the relatively longer antennules, and the modification of the peræopods into two functionally different groups are features common to most of the members of both Glyptonotinæ and Mesidoteinæ; but in *Austridotea* the antero-lateral lobes are relatively slightly developed and their meeting with the postero-lateral lobes is marked by a broad notch (instead of the deep cleft seen in *Mesidotea*), and thus come nearer to the entire margin seen in *Glyptonotus*. Also, as in *Glyptonotus*, the eyes appear as faceted surfaces in both dorsal and ventral views, whereas in *Mesidotea* the eyes are not seen from below, and, due doubtless to the exaggerated development of these lateral lobes, appear to have shifted more mesially on the dorsal surface. In the fossil *Proidotea* the development of these lobes is perhaps even greater than in *Mesidotea*. In the condition of the head, therefore, *Austridotea* comes nearer to the Glyptonotine condition.

The eyes of all the members of these two subfamilies appear to be small*.

The primitive five-jointed condition of the palp of the maxilliped is common to all three above mentioned extant genera, while *Symmius* and *Chiridotea*, the two remaining genera of the two subfamilies, have undergone, presumably independently, a reduction due to fusion of at least two of these (4 & 5)*, a tendency which is very marked throughout the Idoteidæ.

* Such a reduction of the palp is partly achieved in the species *lacustris* Thomson and *rotundicauda* Miers, here relegated to the subgenus *Notidotea* (see p. 126). In this subgenus, too, the eyes are larger, lateral and prominent, differing from other Mesidoteine forms.

A retention of distinct coxal plates on six of the seven free mesosomatic segments is a character shared by *Austridotea* with the other Mesidoteinæ and some of the Idoteinæ, and marks them off from the Glyptonotinæ.

The trisegmented metasome shows only two typical segments, and a third from which the pleo-telson is but incompletely separated by a pair of deep incisures. Fusion of the segments in this region has thus gone further than in any other member of Glyptonotinæ or Mesidoteinæ, and has reached a stage found in many of the more specialized subfamily the Idoteinæ.

A comparable development of the appendix masculina has been seen elsewhere in *Glyptonotus* * and *Mesidotea sibirica*; it has been figured too in *M. sabini*.

In the condition of its uropods also *Austridotea* retains a relatively primitive condition. Both rami are well developed and have persistent muscles; the exopodite * is a thin, comparatively large, oval, membranous lamella, which preserves its fringing plumose setæ and closely resembles that found in *Glyptonotus*. In *Mesidotea* there has occurred a greater reduction in size, it has become triangular in shape and has lost its fringing setæ. The endopodite † is a stiffened triangular plate which underlies and hides a well-developed setose spine, characteristic of the Idoteinæ but wanting in both *Glyptonotus* and *Mesidotea*, and apparently not recorded in *Chiridotea*. In the aberrant *Symmius* the uropod has become a simple unjointed structure.

Austridotea seems therefore to occupy rather a central position among the Idoteids and combines features not previously recorded as occurring together in any one member of this family.

These remarks apply to the two species certainly assignable to this genus, viz., *A. annectens*, sp. n., and *A. benhami*, sp. n.; the latter is identical with *Idotea*

* Tattersall (1921) and Hodgson (1910) both call attention to this character. The former says the large size of this appendix agrees with the condition figured by Pfeffer for *antarcticus*, and goes on to say that its (increased) size in *acutus* may be a character of systematic importance. In a specimen examined by the writer, a ♂ of *acutus*, over 100 mm., the endopodite measured 12 mm. and the appendix 25 mm.

† Calman (1909) regards the usually persistent ramus as endopodite, in opposition to the more commonly accepted view. Throughout this paper the terms exopodite and endopodite are used as by Calman, with whose interpretation the author is entirely in agreement.

lacustris var. β of Chilton's descriptions. The two earlier known forms, *Idotea lacustris* G. M. T. and *I. rotundicauda* Miers, are certainly closely related, and are perhaps even more intermediate in character between Mesidoteinæ and Idoteinæ. They differ from the two *Austridotea* species in several characters which, taken collectively, should possibly be given generic value. In this paper they are separated, provisionally, in a subgenus *Notidotea*.

AUSTRIDOTEÆ, subgen. nov.

With the characters of the genus.

Austridotea annectens, sp. n. (Figs. 1-8.)

Body narrow-ovate, dorsal surface but moderately convex, sparsely punctate (fig. 1). *Head* twice as wide as long, front emarginate, antero-lateral lobe slight, postero-lateral lobe well developed. *Eyes* dorsal, black, of moderate size. *Peræon* segments subequal; the first free segment showing no trace of separation of coxal plates; second to seventh segments have the coxal plates defined by a deep incisure behind, the line of which is produced forwards to the anterior border of each segment in a well-marked suture. *Pleon* nearly as long as the combined length of peræon segments ii.-vii., composed of two short free segments (with slightly projecting epimera) and a pleo-telson from the anterior part of which another equally short segment is partly defined by a pair of deep incisures (fig. 1). The epimera of this incomplete third segment are backwardly produced into a sharp point. Pleo-telson slightly more convex than the peræon, its margin behind the incisures entire, its end pointed.

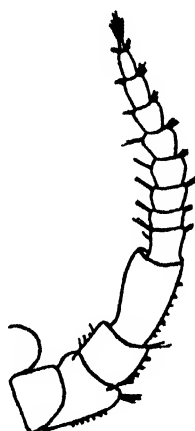
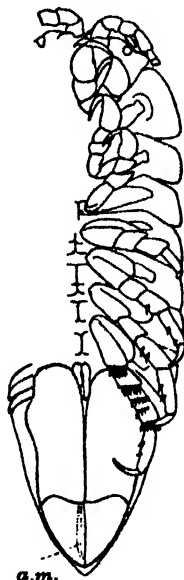
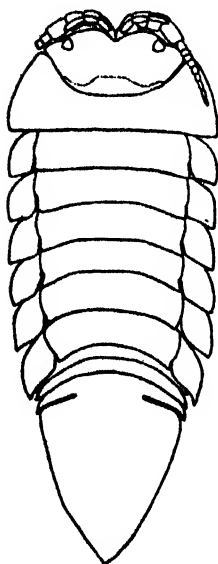
Appendages.—*First antennæ* extending beyond the proximal end of the fourth joint of the peduncle of the second antennæ; peduncle, first joint but moderately stout, second and third slender, subequal; flagellum single-jointed, slightly longer than the third joint of peduncle (fig. 1). *Second antennæ* rather more than one-fourth of the length of the body (nearly 2 : 7), peduncle with joints not expanded and slightly longer than the flagellum, which has 9-10 joints, and lacking, in the ♂, any development of a dense setal fringe (fig. 3). *First maxilla*, outer lobe with 10-11 stout spines, of which the

innermost four or five are more slender and finely denticulate, inner lobe armed distally with three stout, setule-covered flexible spines and one short simple seta. *Maxilliped*, palp rather slender, almost as long as the basipodite (inclusive of the inner plate), fifth joint relatively large, epipodite suboval, its mesial border slightly sinuous, arising from the outer article of the coxopodite (fig. 4). *Peræopods* 1-3 short, forwardly directed and subchelate;

Fig. 1.

Fig. 2.

Fig. 3.



Austridotea (Austridotea) annectens, sp. n.

Fig. 1.—Dorsal view of ♂.

Fig. 2.—Ventral view of one side of ♂; spines indicated on hindmost peræopod only.

Fig. 3.—Second antenna of ♀.

in the ♂ peræopod 1 with propodite stout, smaller in 2 and 3, the second showing no noticeable setosity; in the ♀ all three are similar and less powerfully developed than in the ♂. *Peræopods* 4-7 are longer, increasing in length to the seventh. They are backwardly directed, non-prehensile, with propodite long and slender, and armed with rows of spines. The distal end of the basos is channelled along its under (outer) surface to receive, when the limbs

Fig. 4.

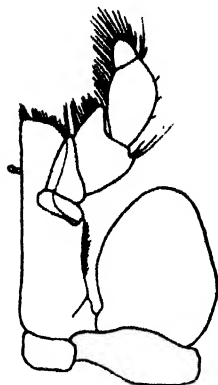


Fig. 5.



Fig. 6.



Fig. 7 a.

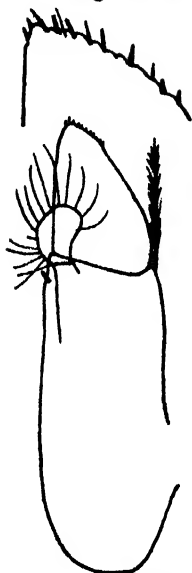
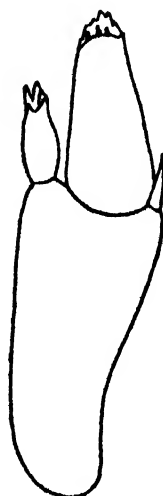


Fig. 7.

Fig. 8.



Fig. 8 a.



Austridotea (Austridotea) annectens, sp. n.

Fig. 4.—Maxilliped, ♀.

Fig. 5.—Pereopod 1, part showing hand of ♂.

Fig. 6.—Pereopod 1, hand of ♀.

Fig. 7.—Uropod, ♀, with apex more highly magnified (7 a).

Fig. 8.—Uropod, juvenile.

Fig. 8 a.—The same, flattened.

are retracted, the narrow apex of the conoidal ischios. *Pleopods*, the first is considerably shorter than the succeeding appendages; the second, in the ♂, shows an extreme development of the appendix masculina (fig. 2, *a.m.*), which attains to a length approximately double that of its related endopodite and extends almost to the hinder border of the covering operculum. If the valves be turned aside the paired, slightly curved rods are quite conspicuous objects stretching well beyond the hindmost fringed borders of the remaining pleopods. The paired uropods (fig. 2), which form the characteristic operculum of this family, are attached by a relatively short hinge-like joint to the under surface of the pleotelson quite near to its lateral border and a little posterior to the lateral incisure. The greatest width is attained near this hinge, from which point the uropod narrows, its lateral border paralleling closely that of the overlying telson till it ends in a blunt-pointed apex just anterior to the end of the body. The hinder third is separated from the basal region (presumably a sympodite) by a curved suture, this apical subtriangular part probably representing the endopodite of less specialized Isopods. The entire border of this basal portion seems to be stiffened by a narrow dorsally-upturned ridge or flange from the distal outer end of which springs a stout plumed spine, almost as long as the endopodite, dorsal to which it lies; from the distal inner (mesial) end of the ridge the exopodite arises. This is developed as a fairly large elliptical lamella, its margin fairly regularly fringed with numerous (14-15) long plumose setæ (fig. 7). The apex of the endopodite shows its outer margin finely crenulate, with a number (9-10) of setæ and spinules arising in the notches (figs. 7, 7 a).

Size.—♂, 11.75 mm. long, greatest breadth 4.5 mm.; ♀, with a brood-pouch containing numerous young, 9.75 mm. long, greatest breadth 4 mm., and a second, slightly smaller ♀, without brood-pouch, somewhat damaged, 9.5 mm. long, 4 mm. in breadth.

Colour.—In life the specimens are grey or greyish brown in colour. In spirit this coloration is seen to be due to scattered and irregular chromatophores (black) on a cream-tinted background. A dark transverse narrow band partly defines the anterior border of the head.

In the ♂, on the pereon segments a broad dark band with a purplish shade marks the middle line, and from this spreads laterally a posterior dark margin to each segment. The epimera have very few chromatophores and appear pale. In the pleon the chromatophores are much more closely aggregated. The antennæ are pale brown. In the ♀, the median band begins on the second pereon segment and is broader; laterally the chromatophores have united to produce a mottling, through which the whitish background appears. The general colour effect is that of a purplish grey. The median band is broken by a pale transverse bar on each of pereon segments 6 and 7. The epimera have sparse chromatophores, but are otherwise almost colourless and translucent. On the pleon the chromatophores are almost completely confluent, the background appearing only in a few small scattered light patches.

Occurrence.—The three specimens were taken (15-17. 12. 35) in Stewart Island from a tiny creek, flowing through very dense bush, beneath a matted litter of broken twigs which nearly choked its flow. The spot was but a few feet above extreme high-water level, a hundred yards or less from the point where the creek discharges into Horseshoe Bay.

Remarks.—The transverse groove on the head is of interest. It stretches across the head about one-fourth of its length from the hinder border, is apparently constant in the more primitive of the Idoteids, the Glyptonotinæ, and the Mesidoteinæ, but is not entirely confined to these subfamilies. A similar and more or less perfect groove is found also in primitive members of other Isopod groups, and in the case of some of the Phreatoicidæ (where its lateral rather than its median part persists) the writer has suggested that it is to be regarded as the vestigial anterior boundary of the first thoracic segment.

In the maxilliped the outer detached joint supporting the epipodite appears to be of constant occurrence in Idoteids, and seems to be generally interpreted as a part of the coxopodite. It seems possible that it is homologous with the proximal joint or stalk of the epipodite as normally developed in the Syncarida.

The channelled condition of the basos of the hinder pereopods is here but slightly developed. This groove,

which has been observed in a number of species, in some cases appearing as a deep and narrow cleft and quite a striking feature, has apparently passed unrecorded.

An exaggerated development of the appendix masculina, as already noted, has been observed also in *Glyptonotus* and *Mesidotea*. In a number of species of other genera which have been examined in this connection the filament has not been found to extend beyond the other pleopods. Such development was probably correlated with an increase in breadth of body, in which case it is to be regarded in *Austridotea* as an inheritance from more *Glyptonotus*-like ancestors.

Juveniles.—There were found in the brood-pouch a number of young about to undergo a moult, possibly the last before escape from the pouch. The body of these is a long oval in shape (that is, more nearly linear than in the adult) and with a suggestion of a median ridge. The head is slightly longer in proportion to its width and less enveloped by the anterior extension of the first free peraeon segment. The eyes seem slightly more dorsal in position, the pleon shorter and relatively broader and rather more broadly rounded behind.

The condition of the uropods is particularly interesting; they hang freely downward instead of being turned inward as valves of the operculum, and rami are less unequal in size and much more obviously the homologous structures they really are. The stout outer spine is devoid of its covering of setules and the exopodite lacks its fringe of plumose setæ (fig. 8). An accidental pressure on the micro-cover flattened out the upturned margins of the sympodite, displaying the spine and both the rami in the same plane (fig. 8 a).

Austridotea (Austridotea) benhami, sp. n.

(Figs. 9 & 10.)

Idotea lacustris var. β Chilton, 1891, p. 131; 1892, p. 263; 1909, p. 658.

Pseudidotea lacustris (part.)* Collinge, 1916, p. 154, pl. vi.

Description.—In general resembling *A. annectens*, from which, however, it may be readily distinguished by the following characters:—First antennæ slightly shorter, just reaching the end of the *third* joint of the peduncle

* See Addendum.

of the second antennæ; the pleo-telson narrows slightly, but the end of the body is evenly rounded. Other differences are:—The eyes are smaller; the palp of the maxilliped is proportionally much stouter and shorter (only about two-thirds of the length of the basipodite including the inner plate), the fifth joint much smaller, and the epopodite oval (fig. 9); the peræopods are arranged in two groups, I.–III. in the ♂, with enlarged propodites, in the ♀ this difference is more noticeable in the first two only, although four may be found forwardly directed.

Fig. 9.



Fig. 10a.

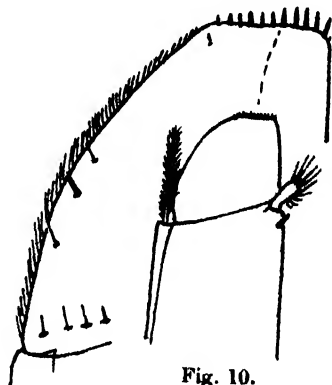


Fig. 10.

Austrilotea (Austridotea) benhami, sp. n.

Fig. 9.—Maxilliped.

Fig. 10.—Part of uropod.

Fig. 10 a.—Apex of same more highly magnified.

The opercula have the hinder border straight (instead of curved and paralleling the hind end of the body); the endopodite is correspondingly shorter, with its apex truncated; the exopodite is rather smaller, with fewer plumose setæ (about ten), which are practically absent from its lateral border (fig. 10).

Colour.—In life this specimen (about 9 mm. long, 4 mm. wide) appeared a dull grey. It was taken from a hollow filled with viscid mud which was traversed in wet weather by a trickle of water dripping into the Ross Creek.

Remarks.—At the time of its capture it was assumed that this was a specimen of Chilton's variety β of *I. lacustria*.

There was, however, no example of this form in the collection in the University of Otago with which to compare it. The more complete study made later at Millport revealed it as an undoubted *Austridotea* and closely related to *annectens*. A recent examination of several specimens (2 ♂♂, neither quite mature, 2 ♀♀, and 1 immature example) identified by Chilton and sent by him to the British Museum (1909, p. 659) as *I. lacustris* var. β , has served to establish this identity. *A. benhami*, therefore, is probably very generally distributed in the fresh waters of the Otago Peninsula, Chilton having recorded it (1892) from various mountain streams around Port Chalmers and in Dunedin, in streams at Waitaki and on the opposite side of Blueskin Bay. The specimens gathered in Campbell Island are less certainly referred to this species. They are stated to "differ slightly in size of eyes" &c. from variety β , and if that variety were to be given a specific name then these, too, "would probably require to be also distinguished by different specific names." In view of the marked difference between *A. benhami* and *lacustris* it is exceedingly likely that these Campbell Island forms are specifically distinct from *benhami*. It is of course possible that they may actually be examples of *annectens*, but it is scarcely credible that Chilton would have missed the conspicuous difference in the shape of the telson of these two species. For the present the identity of this Campbell Island species must be left uncertain.

Of Chilton's specimens of *Austridotea benhami* in the British Museum the largest is an immature ♂ of 11 mm., and in this the appendix masculina, although visible, is still not free from the lamella of the endopodite of pleopod 2. This species probably attains to a larger size than *A. annectens*. It has been named in compliment to Professor W. B. Benham.

The third New Zealand "freshwater" Idoteid, the first to be recorded, *Idotea lacustris* G. M. T., is in all probability not restricted to, but merely tolerant of, fresh water. Tomahawk Lagoon, the type-locality, is barely cut off from the sea, and is doubtless, as Thomson has suggested, spasmodically invaded by the sea. Chilton, later (1909, p. 658 *et seq.*), records "specimens quite similar in colour and other external features" to

I. lacustris var. α from a lagoon "into which salt water may be driven at exceptionally high tide" on Campbell Island; also, from Ruapuke Island, from Port Pegasus in Stewart Island, and upon the West Coast Sounds of Otago "from the mouths of nearly every freshwater stream examined" *. The suggestion therefore is that this is, in all probability, normally an inhabitant of brackish water rather than a truly freshwater form. It was to this species that Miers with some doubts referred his "probably marine" Patagonian specimens (*I. rotundicauda*). Chilton, accepting this identification, suggests (*l. c.* p. 660) that "*Idotea lacustris* is a species widely distributed on subantarctic shores . . . chiefly in brackish waters, but has in more than one place ascended freshwater streams to a considerable height and become slightly modified" to give rise to its supposed freshwater derivatives (*i. e.*, the *Austridotea* species of this account).

Idotea lacustris G. M. T., and probably *I. rotundicauda* Miers, differ, however, rather markedly in certain characters from both of these new species, and their inclusion in *Austridotea* would necessitate a substantial modification of the generic diagnosis which would introduce an undesirable vagueness. To avoid this it has seemed preferable to erect for them a new subgenus.

NOTIDOTEA, subgen. nov.

As *Austridotea*, except that (1) the eyes are large and (owing to the lesser development of the lobes of the head, particularly the postero-lateral) are not shut off from the lateral margin; (2) the retention in the pleo-telson of a second paired cleft which represents the last stage in the fusion of two pleon segments (evidently 3 and 4); (3) the almost complete disappearance of the fifth joint of the palp of the maxilliped; (4) the pleon scarcely narrows to the rounded end. Two other differences relate to the ♂ only: they are (5) the development of a dense fur-like setosity on the second antenna and the second pereopod; and (6) the appendix masculina on the second pleopod attains to a much more moderate development.

* See Addendum. Collinge records specimens sent him by Chilton from "Dunedin Harbour." This, if correct, is of course a marine habitat.

Other features, perhaps of equal importance, are to be found in the shape of the head, the somewhat shorter first antennæ, the longer and stouter second antennæ, and the less evident dimorphism of the peræopods.

Remarks.—It seems probable that the depressed and broadened condition of the body so generally seen in the Isopods had already been acquired before there occurred those changes in the pleo-telson and the uropods which are the most characteristic features of the valviferan facies.

Among extant forms the Mesidoteinæ have probably deviated least from the primitive valviferan condition, the Glyptonotinæ having apparently arisen from them by the exaggerated development of certain features in more perfect adaptation to the creeping habit. The Idoteinæ, with the partial or complete abandonment of this mode of life and the assumption of a more active free-swimming habit, seem to have undergone a reversion towards the more generalized linear form and the loss of the tendency (strongly developed in Glyptonotinæ and Mesidoteinæ) to a dual grouping of the thoracic appendages, while the eyes, freed by the continued shrinking of the lateral lobes, have become lateral and enlarged.

In this view *Notidotea*, as compared with *Austridotea*, s. s., is the more primitive in the stouter condition of the antennæ, in the retention of evidence of a fourth pleon segment (wherein it is more nearly in agreement with the other Mesidoteinæ), and probably too in the retention of the notable setosity upon the antennæ &c. On the other hand, the narrower head, the larger eyes, the virtual loss of the fifth joint of the maxilliped palp, the decreased length of the appendix masculina, and the less evident dimorphism of the peræopods are all to be regarded as modifications of the Austridotean condition in the direction along which the more specialized Idoteinæ may be supposed to have evolved.

If this interpretation be correct it would appear that the relationship of *A. benhami* (*I. lacustris* var. β of Chilton's descriptions) to *Notidotea lacustris* is much less close than he had supposed. On the contrary, it seems likely that *Austridotea* is, comparatively, a long-established freshwater form, and that *Notidotea lacustris* is relatively a recent colonist in fresh water, and the kinship

between them is that of divergent forms with a not too recent, common ancestry rather than that of daughter and parent species.

Austridotea (Notidotea) lacustris (G. M. Thomson).
(Figs. 11-15.)

Idotea lacustris Thomson, 1879, p. 250; Thomson & Chilton, 1886, p. 156; Chilton, 1890, p. 194; *I. lacustris* var. α , Chilton, 1892, p. 265; 1909, p. 658.

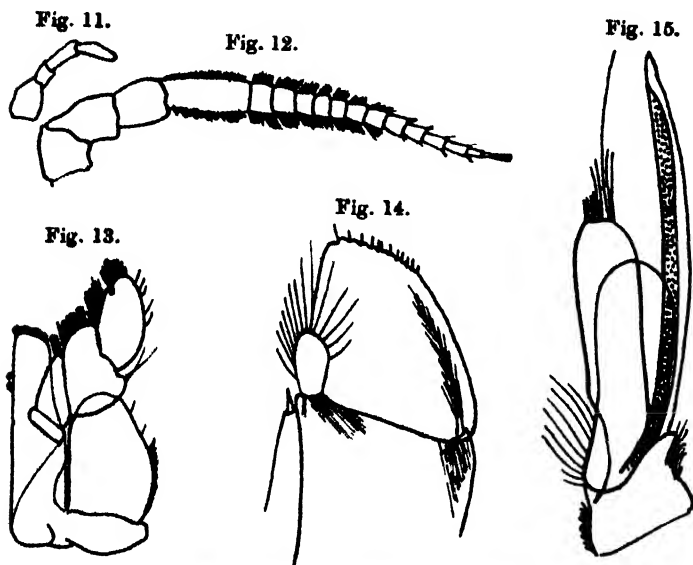
Pentidotea lacustris (part.)* Collinge, 1916, p. 154, pl. vi.

Remarks.—The fuller description given by Chilton in 1890 is fairly complete. No mention is made, however, of the mouth-parts, but the four-jointed condition of the palp of the maxilliped, if it had been observed, might perhaps have been accepted as characteristic of *Idotea*. The division of peraeopods into two series also went unrecorded; the pleopods seem not to have been examined, but the persistence in the uropod of both rami is mentioned, no particular importance, however, being attached to it; the stout setiferous spine is overlooked. The colour is described (*l. c.* p. 195) as dark grey. In a later account (1892, p. 264), when comparing this species with its supposed freshwater variety, Chilton more accurately records the colour as "a uniformly greenish-grey," which is, indeed, more nearly the colour in life and in recently preserved specimens, the green colour predominating. Specimens in the University collection at Dunedin still retained this colour after many years in spirit, while those in the B.M. Collection are now of a uniform dull brown; examples of *Austridotea benhami* similarly preserved have taken on a much paler shade of brown.

Passing next to a consideration of the South American forms which have been assigned to *lacustris*, and which are now part of the British Museum Collection, some idea of how perplexing Miers had found these is afforded by the labels associated with his specimens. These were part of the 'Alert' material: they were collected by Dr. Coppinger at Port Henry in the Straits of Magellan, and were at first referred by Miers (1881) to *Idotea annulata* Dana. Later (1881 *a*) Miers transferred them, provisionally, to *I. lacustris* G. M. T., with a suggestion,

* See Addendum.

that they might prove to be distinct and should then be called *I. rotundicauda*. Four other specimens, collected on the South American coast "between Monte Video and the Straits of Magelhaens" by Dr. Cunningham, were successively named *I. compacta*, *I. metallica*, and *I. annulata* Dana. Yet another pair, labelled *I. annulata*, almost certainly part of this same material (being



Austrodotea (Notidotea) lacustris (Thomson), ♂.

Fig. 11.—First antenna.

Fig. 12.—Second antenna.

Fig. 13.—Maxilliped.

Fig. 14.—Distal part of uropod.

Fig. 15.—Second pleopod.

"collected by Drs. Wallich and Cunningham") seems to have passed into Spence Bates' collection, and much more recently to have come into the British Museum Collection.

These six specimens are preserved in spirit, the first four (from Port Henry) being included in the Dry Collection, but all remained in the Museum Catalogue as *I. annulata* Dana. There could be no question but that this dry material was that which Miers, so hesitatingly, had assigned to *I. lacustris*. It consisted of one largish specimen (about 11 mm. in length) gummed upon a small

strip of card, but which had evidently at some time been pinned, and still bore much corroded material about it, and three much smaller specimens still transfixed by pins. In view of the doubts which Miers had evidently entertained of the specific identity of all of these specimens, and of the poor condition of this dry material, it was thought advisable to make a preliminary examination of the spirit-material.

All of these specimens exhibit the transverse groove upon the head much as figured by Miers for *lacustris*? (1881 a, pl. i. fig. 11), but the eyes are larger and more prominent than is there suggested. The proportions of the various regions agree, however, sufficiently well, and the pleon resembles that of the New Zealand species but has only one pair of marginal clefts. A large ♂, 16 mm. long, shows the second antennæ lacking the characteristic setosity of *lacustris*, and, although relatively long, has a flagellum with but few joints; it is the first peræopod which is furnished with a dense covering of setæ. Peræopods 1-3 have large propodite and prehensile dactyl, and the grooving of the outer surface of the basos of hinder peræopoda is more strongly developed. The palp of the maxilliped has but four joints, a scarcely recognizable lobe being the sole indication of a vestigial fifth joint. A stout flexible spine is borne laterally to the endopodite, but no trace of an exopodite could be discovered.

It became evident that the specimens labelled *I. annulata* ("collected by Dr. Cunningham"), notwithstanding several points of resemblance, were quite distinct from Thomson's species and lacked the essential characters which compel the removal of *lacustris* from the genus *Idotea*.

It was considered inadvisable to attempt any examination of Miers' material in the dry collection until it had been relaxed. The large specimen was safely removed and relaxed well, but the smaller specimens broke when an attempt was made to lift the pins from the case.

Miers had already recorded certain small differences between his specimens and the description given by Thomson; Calman (*vide* Chilton, 1909, pp. 659-60) had noted, however, the existence in Miers' specimens of a second pair of clefts in the pleon which the latter author had apparently overlooked (which are, however, better developed in these than in the New Zealand specimens),

and there seems no question but that the two forms are quite closely related.

That they are identical is not so certain; in certain characters they seem distinct. So since of the four specimens only one is even nearly complete, and this an immature ♀, it is wiser probably, till further material is available, to treat this as a separate species. The details of structure here recorded have been gleaned principally from this larger specimen, but have been confirmed to some extent by an examination of the smaller specimens also.

Fig. 16.



Fig. 17 a.



Fig. 17.

Austridotea (Notidotea) rotundicauda (Miers), ♀.

Fig. 16.—Part of maxilliped.

Fig. 17.—Uropod.

Fig. 17 a.—Apex of same more highly magnified.

Austridotea (Notidotea) rotundicauda (Miers).
(Figs. 16 & 17.)

Idotea annulata Dana ?, Miers, 1881, p. 76.

Idotea lacustris G. M. T. (? *I. rotundicauda*, sp. n.), Miers, 1881 a, p. 40, pl. i. figs. 11–12; Chilton, 1890, p. 194; 1909, pp. 659–60.

Idotea rotundicauda Miers, Hodgson, 1910, p. 4.

Description.—♀. Apparently very near to *lacustris*. First antenna has joint 3 of peduncle rather stouter as compared with flagellum; second antenna stout, retracted would reach nearly to end of peræon segment 3, flagellum 7-jointed. The maxilliped is smaller than in
g*

lacustris and shows small differences in the inner plate of basipodite and in palp (fig. 16). The pleon shows two complete segments, followed by two pairs of clefts separating epimera as well developed as those of the free segments. The exopodite of the uropod is minute, with few setæ, the endopodite rather rounded apically, with a few large, rounded crenations from which spines were wanting (fig. 17).

Colour.—This is described by Miers as of a uniform chestnut-brown. Whether this referred to already dried specimens or to material at that time in spirit is uncertain. If the latter, then, since the collection was a comparatively recent one, it is possible it may have been the colour in life.

ADDENDUM.

Having completed the examination of the British Museum material of *Austriodotea* (*Austriodotea*) *benhami*, sp. n., *A. (Notidotea) lacustris*, and of *I. annulata* Dana, it seemed advisable to make the most of such an opportunity to examine as many other Idoteids as possible. It was especially in relation to the possible retention of an exopoditic lobe and to the degree of development of the appendix masculina in the Idoteinæ that further knowledge was desired, matters to which some systematic importance had been attached but upon which authors in general had supplied little information *.

A number of specimens belonging to several species of *Idotea*, *Paridotea*, and *Pentidotea* were therefore examined, and these without exception confirmed the opinions already formed.

Among the five species of *Pentidotea* represented in this collection, however, the writer found one bearing a label *Pentidotea lacustris* Thomson, deposited by Dr. W. E. Collinge. This was the first intimation that, by an unfortunate oversight, a paper by Collinge dealing with the New Zealand freshwater species *lacustris* had been completely overlooked.

This paper, "Some Remarks upon the Structure and Generic Position of *Idotea lacustris* Thomson," had been published in 1916 in the 'Journal of Zoological Research,' and its discovery suggested the possibility that, all

* Collinge (1918) mentions four genera in which the exopodite persists.

unwittingly, the writer had, in naming a new genus *Austridotea*, been proposing merely to add to the synonymy of *Pentidotea*.

The question could be readily answered by an examination of certain details of structure in the various species available. These were *P. vosnesenskii* (several ♂♀), *P. resecata* (one ♂), *P. whitei* (2 ♀♀), and *P. rotunda* (2 ex.).

It was found that in all of these species the following characters are present :—

(1) The head is rounded, not flattened, is without a transverse furrow, and the eyes are truly lateral.

(2) The pleon shows three complete segments and one pair of short lateral clefts.

(3) First antenna with basal joint of peduncle greatly enlarged.

(4) Uropod shows no trace of exopodite.

(5) In the ♂ the second pleopod bears an appendix masculina of quite moderate length.

(6) The palp of the maxilliped shows the typical five joints.

It was evident then that, apart from this last character, these two genera were not closely alike, and were indeed correctly assigned to different subfamilies.

The next question was that of the possible non-identity of the species examined by Collinge and those forming the subject of this paper. From a reading of the paper itself this seemed improbable, although some of the specimens dealt with were stated by Collinge to be *marine* and to have come from "Dunedin Harbour."

A re-examination of the actual material upon which Collinge had formed his view of the generic position of *I. lacustris* Thomson established the fact that the freshwater species was identical with that named *Austridotea* (*A.*) *benhami* earlier in this paper. Nor were the marine specimens, from Dunedin Harbour, distinguishable from *A. (Notidotea) lacustris* G. M. T., hitherto known, however, only from fresh or brackish water.

Now, as has already been emphasized above, these two species differ to such an extent as to make it desirable to assign them to separate subgenera. Collinge, although labelling his freshwater material var. B, had apparently regarded them as so nearly identical with the typical form that a single description would serve for them both !

This is no doubt in part a regrettable consequence of Chilton's insistence of the near relationship of his two "varieties," so near in his view as to make a specific separation undesirable, notwithstanding Calman's opinion (Chilton, 1909, p. 660) "that the freshwater species seems to be about as good a species as most species are."

With reference to Collinge's paper, therefore, it must be pointed out :—

(1) That *Idotea lacustris* Thomson cannot be assigned to the genus *Pentidotea*.

(2) That, of this material examined by Collinge, the specific name *lacustris* is applicable only to his "marine" specimens, and that in these the palp of the maxilliped has the fifth joint fused with the fourth.

Fig. 18 a.

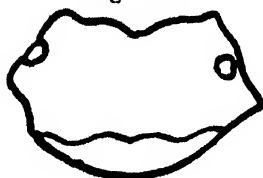


Fig. 18 b.



Austridotea (Notidotea) lacustris (Miers).

Fig. 18 a.—Dorsal view of head of ♂ (drawn with camera lucida).

Fig. 18 b.—Lateral view of head of same.

(3) That this description given by Collinge of "*Pentidotea*" *lacustris* (Thomson) seems to be based almost wholly on an examination of the freshwater form *Austridotea* (*A.*) *benhami*, sp. n. In this the palp of the maxilliped really has five free joints, but (on the other hand) the pleon has but a single pair of clefts posterior to the free segments. Unfortunately some of the details are actually observations made on *lacustris*, and perhaps some of the figures, so that the description is really a "composite" based on two different species.

(4) The representation of the head (pl. vi. fig. 1) is like that of no *Austridotea* species. The accompanying text-figure 18 a has been drawn with the aid of a camera lucida from one of Collinge's marine specimens (*lacustris*), a species in which the postero-lateral lobes are least

developed. The accompanying freehand drawing (fig. 18*b*) attempts to show the relation of the eye to the margin of the head in this species, upon which the posterior lobe partly encroaches.

(5) Apart from this, the remaining figures on Collinge's pl. vi. relate principally to *benhami*, but figs. 10, 11, and 12 are difficult to reconcile. The shape of the pleotelson (fig. 10) is not unlike that of *benhami*, but the sharply pointed apex of the uropod depicted in fig. 11 is like neither *benhami* nor *lacustris*, nor does it agree with fig. 12, where the apex is shown (correctly for *benhami*) as truncated.

(6) There is an inaccuracy in the text where it is stated (p. 155) that only one ♂ from Dunedin Harbour shows the setosity so characteristic of *lacustris*. Actually there are six of these marine specimens deposited by Collinge in the British Museum Collection, and of these four are mature males, all of which show particularly well developed this fur-like investment of setæ on both antennæ and peræopod 2.

(7) Surprisingly, too, Collinge in this redescription omits all mention of that primitive feature the retention of the exopodite, notwithstanding that Chilton had, long ago, called attention to it (1890, p. 196). As a matter of fact these rami stand out quite conspicuously in several of the specimens in which the valves lie partly open. In the ♂, too, of the freshwater specimens from Mihiwaka the backward extension of the appendix masculina is yet another conspicuous feature which has been overlooked.

LIST OF REFERENCES.

- CALMAN, W. T. 1909. "Crustacea," Lankester, 'Treatise on Zoology,' pt. 7, pp. viii, 346, text-illustr.
- CHILTON, CHAS. 1890. "Revision of the New Zealand Idoteidæ." Trans. N.Z. Inst. xxii. pp. 189-204.
- . 1891. N.Z. J. Sci. n. s., i. pp. 131-132.
- . 1892. "Notes on some New Zealand Amphipoda and Isopoda." Trans. N.Z. Inst. xxiv. pp. 258-269.
- . 1909. Crustacea. Subantarctic Islands of New Zealand. Reports, vol. ii. pp. 601-671: text-illustr.
- COLLINGE, W. E. 1916. "Some Remarks upon the Structure and Generic Position of *Idotea lacustris* Thomson." J. Zool. Research, London, i. pp. 153-157, pl. vi.
- . 1918. "On the Oral Appendages of certain Species of Marine Isopoda." J. Linn. Soc., Zool. xxxiv. pp. 65-93, pls. vii.-ix.
- . 1918 a. "Some Observations upon two Rare Marine Isopoda." J. Zool. Res. iii. pp. 63-79, pls. i.-iv.

- HODGSON, J. V. 1910. "Isopoda." Nat. Antarct. Exp. (1901-04), vol. v., Crustacea, ix. pp. 1-77, pls. i.-x.
- MUNN, E. J. 1881. "Account of the Zoological Collections made during the Survey of H.M.S. 'Alert' in the Straits of Magellan and on the Coast of Patagonia.—Crustacea." Proc. Zool. Soc. Lond. pp. 61-79, pl. vii.
- . 1881 a. "Revision of the Idoteidae, &c." J. Linn. Soc., Zool. xvi. pp. 1-88, pls. i-iii.
- RACOVITZA, E. G., & SEVASTOS, R. 1910. "*Pseudotea haugi*, n. g., n. sp., &c." Arch. Zool. exp. gén. Paris, sér. 5, vi. pp. 175-200, pls. ix.-x.
- RICHARDSON, H. 1904. "Contribution to the Natural History of Isopods." Proc. U.S. Nat. Mus. xxvii. pp. 1-89; text-illustr.
- . 1905. "Monograph on the Isopods of N. America." Bull. U.S. Nat. Mus. no. 54, pp. liii, 727; text-illustr.
- . 1906. "Isopodes." Exped. Antarctiques Française (1903-05), pp. 1-22, pl. i.
- SARS, G. O. 1896-99. "Crustacea of Norway, vol. ii. Isopoda, pp. x, 270; 104 pls.
- TATTERSALL, W. M. 1921. "Tanaidacea and Isopoda." Brit. Antarctic Exped. ('Terra Nova'), 1910, vol. iii. pp. 191-258; 11 pls.
- THOMSON, G. M. 1879. "Description of a new Species of Isopodous Crustacean (Idotea)." Trans. N.Z. Inst. xi. pp. 250-251.
- , & CHILTON, CHAS. 1886. "Critical List of the Crustacea Malacostraca of New Zealand." Trans. N.Z. Inst. xviii. pp. 141-159.

VIII.—*Descriptions and Records of Bees*.—CLIX.

By T. D. A. COCKERELL, University of Colorado.

THE species recorded below, including the holotypes, will be found in the British Museum.

Colletes turneri, sp. n.

♀.—Length about 10 mm., anterior wing 7.4.

Black, including mandibles (the apical half very faintly reddish), antennæ (the thick flagellum obscurely brownish beneath except at base), and legs (except the clear red apical joint of tarsi), but the tegulæ copper-red; mesothorax and scutellum densely covered with moss-like very bright ferruginous hair; hair of face and cheeks (the latter very long) clear white, of pleura mostly white, but fulvous on and about tubercles, of metathorax rather dull white; malar space linear; orbits converging below; labrum polished, without distinct pits; clypeus dull and roughened, the abruptly depressed apical margin shining; mesothorax strongly punctured, but the posterior disc nude, highly polished, and impunctate; scutellum polished anteriorly; area of metathorax very coarsely

sculptured, with a transverse ridge. Wings clear hyaline, with a small very dark brown stigma and black nervures; basal nervure falling some distance short of nervulus; second cubital cell very broad, receiving recurrent nervure slightly beyond the middle. Legs with white or whitish hair, including inner side of hind tarsi; middle femora angulate beneath toward base; hind femora red beneath at apex; spurs pale testaceous. Abdomen very broad, the tergites with broad bands of dense felt-like greyish, somewhat yellowish, tomentum, that on first tergite consisting more of hairs, and weakly developed in middle; first tergite very large, with fine dense sculpture running largely in lines; second tergite shining, with very fine close punctures, the sculpture much finer than on first; third like second, the margin under the band dark red; venter with narrow weak hair-bands.

Cape Province: Katberg, Feb. 1-10, 1933 (*R. E. Turner*).

A very beautiful species, so near to *C. latibasis* Ckll. that at first I thought it must be the undescribed female of that species; but the shorter malar space, area of metathorax much more coarsely sculptured, abdominal bands of greyish tomentum, and quite different locality appear to indicate that it is distinct. In Friese's table it runs near *C. zuluensis* Friese, differing by the black legs. Compared with female *C. marleyi* Ckll. it differs by the longer face and broader abdomen. The description of *C. malma* (Cam.) suggests *C. turneri* in some respects, but I saw a male *C. malma* in the Transvaal Museum; it has the metathorax quite different, malar space nearly twice as broad as long, stigma pale reddish.

Colletes infracognitus, sp. n.

♀.—Length about 12.5 mm., anterior wing 9, width of abdomen nearly 5.

Very robust, black, including mandibles, antennæ (the flagellum very obscurely brown beneath), and legs, except that the middle and hind femora are bright clear ferruginous, abruptly contrasting with the black tibiae and trochanters, and the front femora are dusky reddish in part; hair of head and thorax pale greyish, slightly yellowish, becoming white on cheeks and pleura, dense and yellowish white on tubercles, mixed with black on

scutellum and slightly on mesothorax; face very broad (width 2.8 mm.), the orbits hardly converging below; malar space large, broader than long, but not twice as broad as long; labrum with four strong grooves; clypeus very prominent, bare, densely covered with coarse striæ, with scattered strong punctures before the apex; mesothorax well punctured, but shining, the posterior disc polished and sparsely punctured; scutellum shining and punctured; base of metathorax with a narrow transverse band, widest at sides, crossed by plicæ, the part of the enclosure below this band transversely striate; a sulcus runs down pleura from beneath base of wings; tegulæ dark red. Wings brownish hyaline, stigma and nervures black or nearly so; basal nervure falling a short distance short of nervulus; second cubital cell broad, receiving recurrent nervure in middle. Legs with pale hair like that of thorax, the first two joints of hind tarsi with a bright red tuft at end. Abdomen very broad, moderately shining, excessively finely punctured, the first tergite rougher than the second; hind margins of tergites narrowly pallid or reddish; tergites with rather broad bands of pale dense yellowish-white tomentum, not developed on first (except traces at sides), and weak on second; sides of apical tergites with long black hairs before the bands.

Cape Province: Worcester (alt. 794 feet), Sept. 1928 (*R. E. Turner*).

A peculiar robust species, readily known by the bright red middle and hind femora. In my tables it runs near *C. mackieæ* Ckll. and *C. antecessus* Ckll., but is easily separated by the legs and other characters.

Colletes opacicollis Friese.

Friese (Zool. Jahrb. 1925) has called this *C. opacicollis* in his table on p. 522, but described it as *C. opacus* on p. 526. A specimen received from him is labelled *C. opacicollis*. The original description of *C. opacicollis* dates from 1909 ('Die Bienen Afrikas'), and the type-locality is Cradock. My specimen from Friese is from Acornhoek, Transvaal, which is one of the localities cited for *C. opacus*. The first locality cited for *C. opacus* is Cape Town, and it might appear possible that a different species was involved, but the descriptions appear to indicate

the same species, and Friese seems to have regarded them as identical; in his list on p. 521 of the 1925 paper he gives no *C. opacus*.

Colletes capensis Cameron.

I examined this in the British Museum. Hair of mesothorax long and white, of scutellum orange-red; malar space much longer than wide; hair of venter long and white; second cubital cell receives recurrent nervure beyond middle. The specimen (marked type) is in bad condition, but is very near *C. martini* Ckll., differing by the stigma much darker red and second and third tergites with long, thin, outstanding white hair on disc. The hind tibiae have pale yellow hair on inner face.

Colletes antecessus Cockerell.

Cape Province: Bot River, Nov. 10 (*L. Ogilvie*); Swellendam, Nov. 1933, 4 ♀, 7 ♂ (*Turner*).

The male is new. Face broad, with white hair; malar space about twice as broad as long; genitalia very dark; stipites long and slender, with strongly plumose hairs; sagittæ stout, the broad apical part curved, appearing narrowly pointed as seen from above, the inner rods forming rounded projections some distance before the apex; seventh ventral plate very broad, in the style of *C. marginatus* Smith, but not so short and broad, and not angulate at sides; eighth ventral plate shaped as in *C. nasutus* Smith, with a tuft of black hair at end.

Colletes martini Cockerell.

Orange Free State: Norvals Pont, April 16 (*L. Ogilvie*).

Colletes malleatus Cockerell.

♀.—Variety with black tegulæ. Donkerpoort, O.F.S., April 18 (*J. Ogilvie*).

Colletes hirtibasis Cockerell.

Orange Free State: North Bank Halt, Norvals Pont, April 16, 1934, 7 ♀, 2 ♂ (*J. Ogilvie*, *L. Ogilvie*).

The female is new. It resembles the male, but is larger, some being as much as 12 mm. long, with very

long and narrow abdomen; mandibles black; malar space not linear, but not half as long as broad; clypeus in middle depressed, dull and densely punctured, at sides shining; abdomen very hairy at bases. It differs from *C. volkmanni* Friese by the black legs.

The male genitalia are entirely in the style of *C. punctatus* Mocsary, with very broad truncate sagittæ, the dark and thick inner rod going to the end; volsella well developed. The seventh ventral plate, on the other hand, resembles that of *C. spectabilis* Morawitz, though the lobes are broader; the thickened outer rim is present, with long hairs as in *C. spectabilis*. It is interesting to note, in this and other cases, that the modifications of the genitalia and the seventh plate are apparently quite independent.

Colletes bevisi tinctula, subsp. n.

♂.—Length about 8 mm., anterior wing 5.7.

Face, cheeks, and lower part of pleura with long pure white hair; mandibles and antennæ black; malar space about twice as broad as long; legs black except the red terminal joint of tarsi; wings clear hyaline; thorax above with long light ferruginous hair, the scutellum clothed like the mesothorax; second cubital cell receiving recurrent nervure before the middle; first tergite covered with very long erect hair; apical bands of first two tergites fulvescent; abdomen conspicuously glistening, including first two tergites; venter with distinct white hair-bands. The pure white hair on inner side of hind basitarsi is very noticeable. The genitalia are of the style of *C. fodiens* (Fourc.), with broadly strap-like truncate sagittæ; the seventh ventral plate is not at all as in *C. fodiens*, but rather resembles that of *C. coriandri* Pérez, though the lobes are not so broad.

Typical *C. bevisi* Ckll. comes from Natal.

Cape Province: Bot River, Nov. 11, 1933, 2 ♂ (*L. Ogilvie*).

Colletes microdontus, sp. n.

♂.—Length about 8 mm., anterior wing 6.

Black, including antennæ, mandibles reddish apically; hair of head and thorax long and abundant, pure white; head broad; malar space about square, a trifle longer

than broad; mesothorax shining all over, with sparse weak punctures; scutellum shining; area of metathorax with a transverse ridge, the part above it rather large, with irregular weak plicæ; tegulæ small, very dark brown. Wings clear hyaline; stigma pale, with a dark margin; nervures pale; second cubital cell very broad, receiving recurrent nervure in middle; third cubital cell very short. Legs black, with white hair, the tarsi red at tip. Abdomen shining, finely punctured, the tergites with rather broad white hair-bands; first tergite with abundant white hair all over, and second with much coarse white hair on basal part. The genitalia are rather peculiar; base of stipites extremely thick; inner rod of sagittæ thick, bent outwardly near end, and on inner side with a sharp denticle, hyaline wing broad; seventh ventral plate with two quadrate lobes, hyaline in middle and at end, but basal, inner, and outer margins broadly brown. These structures are on the whole nearest to *C. chobauti* Pérez, but the lobes of seventh plate are longer, with the outer brown zone broadest, not the basal one as in *C. chobauti*.

S.W. Africa: Seeheim, Feb. 16, 1934, 2 ♂ (*J. Ogilvie*).

Differs from *C. nanus* Friese by the black flagellum. It is most like *C. opacigenalis* Friese, but that species is larger, with light brown tarsi, pale red stigma not distinctly dark-margined, and second tergite not covered with white hair basally.

Colletes marleyi Cockerell.

Natal: Weenen, 1926, ♂ (*H. P. Thomasset*).

Exactly like the type, with which it was compared. The genitalia resemble those of *C. picistigma* Thoms.; the stipites have the base moderately stout and the hairs on apical part extremely long; the sagittæ have the hyaline part long, broadly strap-shaped, truncate at end, and the thick dark inner rod ending much below the end of the hyaline part; the inner rod has a very minute denticle near base. The seventh ventral plate resembles that of *C. lacunatus* Dours, but the apical corners of the very broad short lobes are projected to a point; the apical margin is strongly biundulate. *C. malleatus* Ckll. is distinctly different, the seventh plate being like that of *C. abeillei* Pérez.

Colletes zuluensis Friese.

Cape Province : Mafeking, Feb. 27 (*J. Ogilvie*), ♀.

Differs from the type in the black hind legs and the mandibles not red at end, but appears to be only a slight variation.

Colletes opaciventris Friese.

Orange Free State : Donkerpoort, April 18, ♀ (*J. Ogilvie*).

Friese described only the male. The female resembles *C. callaspis* Ckll., but is easily distinguished by the hairy dull first tergite, with excessively minute punctures. The clypeus is shining and very coarsely sculptured. The basal part of second tergite is not covered with pale hair, as it is in *C. hirtibasis* Ckll.

Andrena notophila Cockerell.

Cape Province : Katberg, 4000 feet, Oct. 1932, ♀ (*R. E. Turner*).

Anthophora microleuca, sp. n.

♂.—Length about 9 mm., anterior wing 6.5.

Black, including the whole of antennæ; head and thorax with abundant white hair, appearing a little greyish on mesothorax; clypeus (covered with white hair) light yellow, with black lateral margins; labrum (except small basal spots) and mandibles (except tips) light yellow; eyes reddish brown; mesothorax and scutellum dull; tegulæ dark basally, but outer margin broadly pale reddish. Wings clear milky hyaline; basal nervure falling far short of nervulus; second cubital cell high and narrow, receiving recurrent nervure beyond middle. Legs black, with white hair, black on inner side of hind basitarsi; middle tarsi simple, the last joint elongated. Abdomen covered with white hair, forming dense bands on apical margins of tergites, but thin basally, so that the abdomen appears banded; apex bidentate.

S.W. Africa : Swakopmund, Feb. 6, 1934 (*J. Ogilvie*). The locality is on the coast.

This small species has the aspect of *A. vernayi* Ckll., but that has narrower abdominal bands, green eyes, and different face-markings. It certainly belongs to the group or subgenus *Micranthophora*, which has many species in

the south-western parts of North America. Looked at from above, the thorax appears dark and the hair of the face pure white.

Melitta turneri Brauns.

Cape Province : Prince Albert Road, Nov. 1931 (*R. E. Turner*).

Heriades diminutus, sp. n.

♂.—Length about 3.2 mm., anterior wing 2.4.

Black, with white pubescence, forming slender white bands on margin of first two tergites ; flagellum slender, obscurely reddish beneath, not reaching end of thorax ; mandibles strongly reddened apically, bidentate ; labrum black, shining ; clypeus with the margin simple, the disc exposed, coarsely punctured ; head rather large, circular seen from in front, with dense white hair covering sides of face, giving the same effect as the lateral marks of *Prosopis* ; cheeks very coarsely punctured, with a row of punctures along orbit ; mesothorax coarsely punctured, the punctures well separated on disc, median groove distinct ; scutellum not so closely punctured and with very long hairs posteriorly ; axillæ not dentate, but there is a minute dentiform process on each side of metathorax. Legs black, the tarsi rufous at end ; tegulæ dark brown. Wings dusky hyaline, nervures dark brown ; first recurrent nervure joining extreme basal corner of second cubital cell. Abdomen subglobose, broadly rounded apically, the tergites punctured in the same manner as mesothorax ; first two tergites with marginal fringe of flattened pure white hairs, but the others with only inconspicuous bristles.

Cape Province : Blaukrans, near Calvinia, October 1931 (*L. Ogilvie*).

The smallest *Heriades* known. By the venation and ornamentation of abdomen it resembles *H. matopensis* Ckll., but it is much smaller than that species, with shorter abdomen and largely red mandibles. The white patches at sides of face are as in *H. larvatus* Friese. *H. arnoldi* Friese agrees in the red colour of the mandibles, but has the wings almost milky white and longer antennæ.

IX.—Description of Female of *Automolis pulcherrima* and a new Species of *Automolis*. By Lord ROTHSCHILD.

AUTOMOLIS PULCHERRIMA ♀ differs from ♂ in being much larger, in the ground-colour of the fore wings being buffy yellow NOT cream-white, in the third transverse band NOT BEING interrupted and very largely expanded on costal $\frac{1}{3}$, in the two lower red streaks along the veins much expanded and joined inwardly, and in the hind wings being salmon-carmine, NOT white.

♂. Length of fore wing 22 mm.; expanse 51 mm.

♀. " " 31 " " 71 "

I received this ♀ with a second ♂, all three from Goyas.

Automolis spitzi, sp. n.

♂.—Pectus salmon-scarlet; antennæ reddish brown; fore legs scarlet with single black ring; frons dull brownish red; patagia brown washed with scarlet and with central black dot; a broad white band behind patagia white; tegulæ and rest of thorax dull brownish red with transverse black line near centre; abdomen scarlet with row of dorsal black spots on outer $\frac{1}{2}$. Fore wing slate-grey washed with crimson, costal area basal half white with basal and distad black dots, distal half crimson; outer $\frac{2}{5}$ ths, except apical $\frac{1}{6}$, milk-white with rows of black dots along nervures, three black and red terminal spots on veins 2, 3, and 4; basal $\frac{1}{6}$ of wing obliquely white with black and red patch followed by a black and two red transverse lines, outer apical dark $\frac{1}{6}$ bordered with crimson. Hind wings white with slight crimson wash along abdominal area.

Length of fore wing 30 mm.; expanse 69 mm.

Hab. Leopold Bulhoes, Goyas.

Named after the collector, R. Spitz.

X.—Notes on Fossorial Hymenoptera.—XLVI. On new Australian Thynnidae. By ROWLAND E. TURNER.

Zaspilothynnus rubropictus, sp. n.

♂. Black; mandibles with a pale yellow spot at the base, dark ferruginous at the apex; a minute spot on each side at the apex of the interantennal prominence and a transverse line on the metanotum pale yellow;

pronotum, the middle of the mesonotum, scutellum, propleuræ, mesopleuræ, tibiæ, and the basal joint of the tarsi dull ferruginous red; sixth and seventh tergites, the apex of the fifth tergite, and all the sternites a rather brighter ferruginous red; four basal tergites with a bright yellow spot on each side, small on the basal, larger and somewhat transverse on tergites 2-4. Wings fusco-hyaline, nervures black. Pubescence whitish, long and rather dense on the clypeus and pleuræ.

Clypeus strongly narrowed to the apex, finely and closely punctured, with a strong longitudinal carina. Head and thorax opaque, very closely punctured, rather coarsely on the mesonotum and scutellum, the latter with a distinct longitudinal carina; median segment more finely punctured; tergites shining, sparsely punctured, somewhat constricted at the apex. Seventh tergite coarsely rugose, broadly subtruncate at the apex. Sixth sternite with a short spine on each side at the apical angles. Hypopygium subtriangular, with a stout apical spine. Second recurrent nervure separated from the second transverse cubital nervure by a distance not exceeding one-third of the length of that nervure.

Length 13-16 mm.

♀. Black; mandibles and flagellum dark ferruginous; pubescence grey, rather dense and long on tergites 3-5.

Head smooth and shining, with a short frontal sulcus, broader than long, somewhat rounded at the posterior angles, broader than the pronotum. Thorax and median segment rather closely punctured, much more clearly on the pronotum than elsewhere, the pronotum broader than long, as long as the scutellum and dorsal surface of the median segment combined, the latter obliquely truncate posteriorly. First tergite densely pilose on the anterior truncation, very finely punctured, with a transverse carina, widely emarginate in the middle, nearer to the apex than to the base, the apical portion of the tergite beyond the carina finely punctured-rugulose. Second tergite with two transverse carinæ near the base, the carinæ very near together in the middle but more widely separated at the sides, the space between the carinæ very closely and finely punctured; the apical portion of the segment transversely rugulose, the apical margin forming a low carina. Pygidium very narrow at the

base, the posterior truncation narrow, elongate-ovate. Fifth sternite rugose.

Length 8 mm.

Hab. Dongarra, W. Australia; September 1935 (*Turner*).

This is not a very typical *Zaspilothynnus*, but is better placed in that genus than elsewhere.

Elidothynnus crucis, sp. n.

♂. Black; mandibles, except the apical tooth, clypeus, orbits of the eyes, broadly interrupted on the summit, pronotum with a small triangular black spot in the middle; propleuræ broadly black in the middle, tegulæ, a large square spot on the posterior half of the mesonotum, a large spot on the scutellum, a transverse band on the metanotum, and a broad transverse band, sometimes narrowly interrupted in the middle, on tergites 1-6 yellow; wings fusco-hyaline, darker along the costa.

Clypeus broadly truncate at the apex, the basal angles pointed above the base of the mandibles, convex, shining and sparsely punctured. Head opaque, finely and closely punctured, with sparse grey pubescence. Thorax more sparsely punctured, especially so on the scutellum and metanotum, which are almost smooth; pleuræ and median segment opaque and rather thickly clothed with long whitish-grey pubescence. Tergites 1-6 very sparsely punctured, the sternites more closely but shallowly punctured. Seventh tergite broadly truncate at the apex, coarsely obliquely striated, with large punctures between the striæ. Hypopygium subtriangular, produced into a blunt spine at the apex, without lateral spines. First transverse cubital vein branched, the inner branch extending to the subcostal, not abbreviated as is usual in the family. Second recurrent nervure received by the third cubital cell at a distance from its base equal to nearly half the length of the second transverse cubital nervure.

Length 18 mm.

♀. Black; head, scape, and legs ferruginous red; mandible from the base to the middle, clypeus, and basal half of the flagellum pale luteous; pronotum, sternum, and the apical margins of the abdominal segments brown; apical half of second tergite ferruginous brown. Pilosity on the tergites and sternites long and grey on the basal

segments, fulvous on the apical segment, with a cluster of long hairs on each side of the pygidium.

Clypeus short, transverse, without a carina; scape sparsely punctured, clothed beneath with long pale hairs; head shining, rather sparsely punctured, with two deep punctures on the vertex, without a frontal sulcus, much broader than long, and very strongly rounded at the posterior angles. Thorax sparsely and finely punctured, pronotum as long as the scutellum and median segment combined, nearly twice as broad anteriorly as long, slightly narrowed posteriorly; scutellum about equal in length to the dorsal surface of the median segment, the apical slope of the latter strongly oblique. Basal half of the first tergite raised, arcuate posteriorly, punctured, and with a fringe of long hairs; the depressed apical portion closely and delicately transversely striated; second tergite with two strong transverse carinae near the base, beyond these the segment is closely and delicately transversely striated to the apex. Tergites 3-5 closely punctured and clothed sparsely with long hairs at the base, the apical margin depressed and almost smooth. Pygidium long and very narrow. Fifth sternite coarsely rugose, the sculpture somewhat obscured by the long and dense pilosity.

Length 10 mm.

Hab. Southern Cross, W. Australia; Dedari, 40 miles W. of Coolgardie, W. Australia; January 10-22, 1936 (Turner).

Nearly related to *E. mobilis* Turn., but differs in the sculpture of the two basal tergites of the female, in the colour of the legs in the male, and in other details. *E. agilis* Sm. is less closely related.

Encopthynnus atrifacies, sp. n.

♂. Rufo-ferruginous; head and median segment black; mandibles and flagellum ferruginous; the apical margin of the clypeus narrowly luteous; metanotum black, narrowly bordered posteriorly with dull yellow. Wings clear hyaline, nervures black.

Clypeus convex, produced narrowly at the apex, widely emarginate on each side, the angles subdentate. Pronotum as broad as the head, short, the anterior margin

almost straight; tergites short and broad, 2-6 with a spine on each side at the apical angles; hypopygium tridentate, the lateral teeth short and blunt, the middle tooth longer and acute. Tergites 2-6 strongly constricted at the base, the basal depression finely crenulate. Closely punctured, more finely on the metanotum and median segment than elsewhere; pronotum feebly transversely rugulose. Second recurrent nervure received just before one-quarter from the base of the third cubital cell.

Length 10 mm.

♀. Black; smooth and shining; head subquadrate, rounded at the posterior angles, scape curved, with a small tuft of hairs at the outer apical margin. Clypeus small, truncate at the apex, not carinate. Mandibles with a small blunt tooth on the inner margin at about two-thirds from the base. Pronotum subquadrate, a little broader than long, distinctly narrower than the head, the whole thorax very shallowly and sparsely punctured. Scutellum and median segment combined a little shorter than the pronotum, the dorsal surface of the median segment about one-third longer than the scutellum. Tergites 1-3 broadly depressed at the apex, the raised basal portion widely emarginate, the depressed portion luteous and very finely transversely aciculate. Pygidium linear; sternites sparsely pilose; fifth sternite sparsely punctured, clothed apically with long fulvous hairs.

Length 7 mm.

Hab. Merredin, W. Australia; December 12-13.

Closely related to *E. spinulosus* Turn., the type of the genus, but the male is easily distinguished by the black head and the different form of the hypopygium. The head of the female is black, not red as in *spinulosus*, and the raised basal portion of the tergites is not disconnected in the middle. *E. spinulosus* occurs in the same locality and at the same time.

Eirone aliciae, sp. n.

♂. Black; mandibles, except the extreme apex, antennæ, palpi, tegulæ, median segment, four basal abdominal segments, and the legs ferruginous red; extreme apex of the seventh tergite and the hypopygium testaceous; wings flavo-hyaline, nervures fusco-ferru-

ginous. Mandibles tridentate, the outer tooth long and acute, the inner one not well defined, forming a broad truncate edge. Clypeus short and broad, the apical margin feebly sinuate on each side, a stout porrect spine at the base; interantennal prominence well developed, rounded at the apex, with a shallow longitudinal sulcus. Head and thorax opaque, very closely and rather strongly punctured, with rugæ on the vertex; a depressed, crenulate line separating the scutellum from the mesonotum. Median segment very closely but rather finely punctured, smooth at the extreme base. Tergites sparsely punctured, the two basal segments almost smooth, the punctures very small. Hypopygium small, subtruncate at the apex, with a short fringe of golden hairs. Pubescence of mandible, front, pleuræ, median segment and apical segments of the abdomen pale golden.

Length 12-18 mm.

♀. Mandibles with a long apical tooth and a small tooth near the middle of the inner margin; clypeus short, truncate at the apex, not carinated. Head rectangular, a little longer than broad, deeply and rather sparsely punctured, the punctures more or less confluent longitudinally. Pronotum about twice as long as the scutellum but a little shorter than the median segment, much narrower than the head, the anterior angles rounded. Median segment gradually broadened from the base to the apex; thorax and median segment more finely and sparsely punctured than the head, a few of the punctures confluent longitudinally. First tergite abruptly truncate anteriorly, a little shorter than the second. Abdomen very shallow punctured, the punctures tending to be confluent; sixth tergite with a low longitudinal carina, rounded at the apex. Hind tibia with a row of eight spines; tarsal ungues with a small tooth in the middle. Ferruginous brown; legs and antennæ fulvo-ferruginous.

Length 10-11 mm.

Hab. Tambourine Mountain, S.E. Queensland; April and May 1935 (*Mrs. R. E. Turner*).

Somewhat resembles *E. ruficrus* Turn., but is a more robust species with a very different clypeus, and both abdomen and wings are of a deeper colour. The median segment is red in this species, black in *ruficrus*.

Rhagigaster rugifer, sp. n.

♀. Black; flagellum, a large subquadrate mark on each side of the front, touching the eyes and leaving only a narrow, median, black line, and the fore tarsi fulvous.

Head subrectangular, as broad as long, deeply but not very closely punctured, some of the punctures confluent longitudinally, the fulvous marks smooth in the middle. Thorax and median segment coarsely but not very closely punctured, the punctures in the middle of the pronotum strongly confluent longitudinally. Median segment longer than the pronotum by about one-quarter, broadened from the base, the width at the apex equal to two and one-third of that at the base. Tergites 1-5 coarsely punctured, the punctures in the middle of the segments confluent longitudinally; sixth tergite almost smooth, with a few small scattered punctures, subcarinate longitudinally in the middle. Tarsal unguis with a median tooth.

Length 10-11 mm.

♂. Entirely black; wings hyaline, nervures fuscous.

Clypeus truncate at the apex, with a raised, triangular, shining and sparsely punctured median area from base to apex. Antennae rather short, only half as long as the costa. Head, thorax, and median segment coarsely punctured-rugose, less coarsely on the head than elsewhere; anterior angles of the pronotum rather prominent. Abdomen slender, shallowly punctured, more closely on the basal than on the apical segments. Hypopygium in the form of a recurved spine, as usual in the genus, but with a short spine in the middle on the upper side. Pubescence whitish, the hairs on the outer side of the mandibles pale fulvous.

Length 13-15 mm.

Hab. Dongarra, W. Australia; September 1935 (*Turner*).

Related to *R. corrugatus* Turn. from New South Wales; differing in the female in the narrower and differently coloured head and in the less coarse sculpture of the whole insect, the tergites in *corrugatus* being longitudinally striated.

The male differs in the form of the triangular area of the clypeus, which in *corrugatus* is confined to the apical half, and in the much closer sculpture of the head and thorax.

XI.—*Some new Asiatic Bees of the Subfamily Anthidiinæ (Apoidea).* By G. A. MAVROMOUSTAKIS, Limassol, Cyprus.

THE types of the new Anthidiine bees described in this paper will be placed in the British Museum.

Anthidium kashmirenses, sp. n. (Figs. 1 & 2.)

Male.—Length 8.5 mm.

Entirely black and hairy; clypeus, lateral face marks (filling space between clypeus and eyes) not reaching level of insertion of antennæ, ochreous with reddish suffusion (due to cyanide); a very small ochreous mark above top of eyes; clypeus punctured, shining, lower margin straight, upper part narrowly polished and shining; supraclypeal area nearly polished and shining except the narrowly punctured sides and upper part; mandibles ochreous, apex reddish brown; antennæ black; third joint longer than second or fourth, fourth and fifth equally long; vertex and occiput densely punctured, moderately shining; a polished space on each side of lateral ocelli; front with dull white hairs; clypeus, supraclypeal area, sides of face up to insertion of antennæ, scape with dense and somewhat long shining white hairs; vertex and occiput with dense and somewhat long yellowish-white hairs. Thorax black, with dense and somewhat long whitish hairs above, and shining white hairs at sides; mesonotum dull and densely punctured; scutellum normal; tegulæ black, finely punctured. Wings nearly clear, upper part of marginal cell slightly clouded; second recurrent nervure interstitial with second transverse cubital nervure; second cubital cell very slightly longer than first; femora and tibiæ black, and with yellowish-white hairs; tarsi with basitarsi yellowish brown, rest of joints reddish brown; hind basitarsi yellowish on outer side; tarsi covered with very light yellowish-brown hairs; hind basitarsi densely covered with short and dense shining yellowish-brown hairs on inner side; pulvilli absent; hind spurs yellowish. Abdomen black and shining; first tergite with basal part punctured,

rest finely punctured (the punctures shallow), but the apical margin narrowly impunctate and polished; second and third tergites densely punctured at sides, rest with fine and somewhat minute shallow punctures; sixth tergite with lateral spine; seventh tergite bilobed and broadly incised, the lobes with the apex of inner side pointed; a longitudinal median carina on seventh tergite projected as a long spine between the lobes, but the spine shorter than the lobes (fig. 1); first abdominal tergite with dense and long shining white hairs; tergites 2 to 7 with somewhat dense and long shining bright fulvous hairs; ventral segments black, sternites 2 to 4 with the apical half, first and fifth with the apical margin, yellowish brown; fourth ventral segment with deeply incised apical margin in middle; ventral segments with yellowish-brown hairs.

Fig. 1



Fig. 2.



Fig. 1.—Sixth and seventh abdominal tergites of *Anthidium kashmirensis*, sp. n., ♂.

Fig. 2.—Seventh abdominal tergite of *Anthidium comatum* F. Mor., ♂ (drawn by V. B. Popov from the type).

KASHMIR: Gulmarg, 1 ♂ (type), Summer 1913 (*Lt.-Col. F. W. Thomson*).

Related to *Anthidium montanum* F. Mor., but differs by the form of seventh tergite and the colour of the pilosity. *Anthidium kashmirensis*, sp. n., differs from *Anthidium comatum* F. Mor., in the colour of pilosity and tegument, the length of cubital cells, and the form of seventh tergite-(fig. 2).

Anthidium sikkimense, sp. n. (Figs. 3 & 4.)

Male.—Length 9.5 mm.

Black and shining; clypeus densely punctured (the punctures covering upper part), moderately shining,

lower margin incised; supraclypeal area punctured, base narrowly polished; mandibles yellow, apex black; clypeus, sides of face not reaching level insertion of antennæ, ochreous; a rounded ochreous spot above top of eyes; antennæ black; all face below antennæ with somewhat long shining white hairs; front with greyish-white hairs; vertex and occiput with dull yellowish-white hairs. Thorax with dense and somewhat long whitish hairs above, and dense shining white hairs at sides; mesonotum dull, densely punctured; scutellum normal. Wings nearly clear, basal part of marginal cell and apical margin slightly clouded; second recurrent nervure interstitial with second transverse cubital nervure; second cubital cell slightly longer than first; tegulæ black, finely punctured. Legs black, last small tarsal joint black-brown; base of claws

Fig. 3.

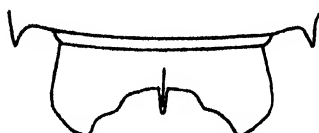


Fig. 4.



Fig. 3.—Sixth and seventh abdominal tergites of *Anthidium sikkimense*, sp. n., ♂.

Fig. 4.—Sixth and seventh abdominal tergites of *Anthidium montanum* F. Mor., ♂.

yellowish brown; femora with white hairs; tibiæ with yellowish-white hairs; tarsi with yellowish-brown hairs; hind basitarsi densely covered with shining yellowish-brown hairs on inner side; pulvilli absent; spurs yellowish brown. Abdomen black and shining; first and second tergites very finely punctured (the punctures shallow and irregular); tergites 2 to 4 with two median and two lateral very pale yellow spots; fifth tergite with two median very pale yellow spots; first tergite with somewhat dense and long white hairs; second tergite with dense and long yellowish-white hairs; tergites 3 to 7 with dense and somewhat long yellowish-brown hairs; sixth tergite with lateral spine; seventh tergite bilobed, as in *Anthidium montanum* F. Mor., but the form of the lobes different (fig. 3); fourth ventral segment with the

apical margin entire, and possessing some short and very dense hairs in middle; apical margin of sixth ventral segment truncate, with rounded sides, and a short and stout bifid median projection.

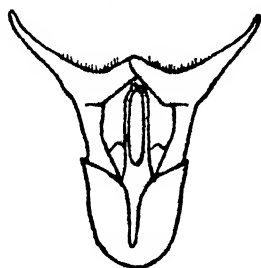
SIKKIM : Teesta Vy., Tungu, 13-14,000 feet, 1 ♂ (type), 1-15. vii. 1903 (Tibet Expedition).

Anthidium sikkimense, sp. n., is related to *Anthidium montanum* F. Mor., but is very distinct, as the latter has the clypeus punctured with the upper part narrowly polished, impunctate, and shining, and the lower margin straight. Besides this, *Anthidium montanum* differs in the colour of the legs and pilosity and in the form of seventh tergite (fig. 4), the truncate apical margin of sixth ventral segment with the median projection entire.

PARAANTHIDIUM. (Fig. 5.)

Pulvilli present; second recurrent nervure out of second transverse cubital nervure; scutellum slightly

Fig. 5.



Genitalia of *Paraanthidium interruptum* (F.).

projected, rounded at sides and emarginate or subemarginate in middle; clypeus broader than long; seventh abdominal tergite hidden below the sixth; maxillary palpi 3-jointed, first joint very small; second joint twice longer than first; third joint somewhat longer than second; labial palpi 4-jointed, second joint somewhat longer than first; stipes large, beak-like, and enclose the small sagittæ between them (fig. 5); upper margin of stipes with short hairs; volsellæ small.

Genotype : *Anthidium interruptum* F. (Lectotype).

Friese described *Paraanthidium* as a subgenus ('Die Bienen Europas,' iv. 1898), but the species included by Friese in his subgenus *Paraanthidium* are a mixture of species belonging to diverse groups. *Paraanthidium* is a distinct genus, and Cockerell (Ent. Rec. London, xxi. pp. 269-270, 1909) has designated as type *Anthidium interruptum* F. *Anthidium luteipes* Lep., *A. zonatum* Friese, *A. fasciatellum* Friese, and *A. interruptum* F. are members of the genus *Paraanthidium*. The Oriental genus *Protanthidium* (Ann. & Mag. Nat. Hist. (7) vii. pp. 49-50, 1901) has the maxillary palpi 3-jointed and the scutellum bilobed, and it is probable that *Paraanthidium* and *Protanthidium* are identical. I have examined a paratype of *Protanthidium pendleburyi* Ckll., from Malay Peninsula, and that species has the clypeus broader than long, the scutellum slightly projected, rounded at sides and slightly emarginate in middle, and the other generic characters alike to those of *Paraanthidium*.

Paraanthidium muiri, sp. n.

Female.—Length about 12 mm.

Black and robust ; head black and rounded ; clypeus broader than long, slightly convex, finely and densely punctured, moderately shining, lower sides strongly and densely punctured ; clypeus with a very slight longitudinal keel, upper part very narrowly impunctate and shining, lower margin slightly emarginate in middle ; supraclypeal area slightly convex, densely punctured, and moderately shining ; sides of face (between clypeus, supraclypeal area, and eyes) very strongly and densely punctured and shining ; mandibles large and black, minutely and very densely punctured, with five short rounded black-brown teeth ; scape black, flagellum brown ; third antennal joint slightly longer than second or fourth, but shorter than 3+4 ; front strongly and densely punctured, moderately shining ; vertex and occiput moderately shining and very strongly punctured ; sides of face, upper half of clypeus, cheeks with somewhat dense and very short yellowish-white hairs ; mandibles densely covered with very fine and short light yellowish-white

hairs (except the apex); vertex and occiput with some very sparse and short yellowish-brown hairs. Thorax black; mesonotum strongly and densely punctured, moderately shining; scutellum slightly projected, apical margin subcrenulate, rounded at sides and broadly emarginate in middle; area of metathorax dull, with sparse punctures; tegulae finely and densely punctured, brown, with faint deep yellow spot in front; sides of mesonotum (near tegulae) with a faint and short deep yellow stripe; scutellum with subapical deep yellow stripe broadly interrupted in middle; mesonotum with somewhat dense and very short whitish hairs in front, rest of mesonotum and scutellum with very sparse and short light yellowish-brown hairs. Wings slightly clouded, upper part of marginal cell clouded; second recurrent nervure out of second transverse cubital nervure; anterior femora dark brown, apical half yellowish-brown beneath; middle and hind femora very dark brown; anterior tibiae brown and yellow-brown on inner side; middle tibiae broad, dark brown and yellow-brown on inner side; hind tibiae broad and mostly dark brown; anterior and middle tarsi with basitarsi brown, small joints red-brown; hind tarsi with basitarsi dark brown, small joints red-brown; middle basitarsi broad, base as broad as apex; hind basitarsi broad, base broader than apex and densely covered with pale yellowish-brown hairs on inner side. Legs with very short and dense light yellowish-white hairs; pulvilli present; spurs yellowish brown. Abdomen broad, black, and moderately shining; first tergite with base somewhat strongly punctured, rest densely punctured; sides of first tergite with a deep yellow mark; second and third tergites somewhat densely punctured, second with transverse and deep yellow linear stripe broad at sides; third tergite with broad and transverse median deep yellow stripe, broad at sides; all region below the yellow on second and third tergites deep brown; base of fourth tergite black, apical margin reddish brown, rest deep yellow; fifth and sixth tergites deep yellow, apical margin of fifth narrowly reddish brown; first tergite with some whitish hairs; tergites 2 to 5 with very short light golden hairs; sixth tergite covered with very short light golden hairs; ventral scopa covered

with pollen, but basal hairs white; maxillary palpi 3-jointed.

CHINA: How Lik, 1 ♀ (type), 1911 (*F. Muir*).

Dianthidium insulare lemesium, var. nov.

Female.—Black; clypeus yellow, lower margin very narrowly black; lateral face marks (filling space between clypeus and supraclypeal area and eyes) reaching top of eyes, sides of supraclypeal area, an oval spot below median ocellus, an entire occipital stripe a little descending on cheeks, all yellow; first abdominal tergite with large lateral mark attenuated within and nearly reaching middle; second and third tergites with interrupted yellow stripes; fourth and fifth tergites with transverse and broad yellow stripes; sixth tergite yellow except the black apical margin; scape black, with a very small yellowish-brown apical mark beneath.

Male.—First abdominal tergite with large lateral mark (attenuated in middle) nearly reaching middle; second tergite with a transverse and broad yellow stripe (slightly interrupted in some paratypes); tergites 4 to 7 yellow, apical margins of tergites 3 to 6 black-brown.

CYPRUS: Limassol, 1 ♀ (type), 26. vi. 31, 1 ♂ (allotype), 22. vi. 30; 2 ♂, 1 ♀ (paratypes), 22. vi. 30; 1 ♀, 1 ♂ (paratypes), 23. vi. 30; 1 ♂ (paratype), 14. vi. 31; 1 ♂ (paratype), 17. vi. 31; 1 ♀ (paratype), 29. vi. 31; all the series collected by G. A. Mavromoustakis.

Dianthidium insulare persicolum, var. nov.

This variety differs from the Cyprus variety as follows:—

A broad longitudinal stripe below median ocellus reaching supraclypeal area; lateral face marks and occipital stripe broad; scape with apical yellowish mark beneath; axillæ and scutellum entirely yellow, scutellum very narrowly black at base; first abdominal tergite with interrupted yellow stripe; second tergite with broad yellow stripe slightly interrupted in middle; third tergite with entire yellow stripe; sixth tergite mostly yellow.

S.W. Persia, 1 ♀ (type), 1900 (*Escalera*).

XII.—*On the Type-locality of Ellobius talpinus Pallas.*

By J. L. CHAWORTH-MUSTERS. From the Department of Zoology, British Museum (Natural History).

IN his description of *Mus talpinus* (Nov. Comm. Acad. Sci. Petrop. vol. xiv. pt. 11, p. 568, 1770) Pallas gives as a locality "in regionibus australionibus Russiæ, ad occidentem Volgæ sitis." Reference to Pallas's *Reise* (*Reise d. versch. Prov. Russ. Reiche* Vol. p. 164, 1771) shows that Pallas first observed this animal in abundance at Kostytschi on the west bank of the Volga between Samara and Syszran. A footnote referring to *Mus talpinus* on this page says "Man wird die Beschreibung dieses wunderlich gestalten Thieres in den Abhandlungen der Kayserl. Academie der Wissenschaften finden." This footnote undoubtedly refers to Pallas's description in the Nov. Comm. Acad. Sci. Petrop., and there can be no doubt as to the exact type-locality of this animal.

XIII.—*On the Nomenclature of the Palæarctic Chipmunk.*

By J. L. CHAWORTH-MUSTERS. From the Department of Zoology, British Museum (Natural History).

THE name usually applied by mammalogists to the Palæarctic Chipmunk is *Eutamias asiaticus* Gmelin, based upon *Sciurus striatus* s. *asiaticus* J. F. Gmelin, in Linnæus, Syst. Nat. 13th ed. vol. i. p. 150, 1778. This name is, however, antedated by *Sciurus sibiricus* Laxmann ('Sibirisches Briefe,' p. 69, 1769). There can be no doubt that Laxmann's description refers to the Chipmunk, and he even gives it the vernacular name of "Burunduk." This description is to be found in the fourth letter which was written to Beckmann from Barnaul in Western Siberia, and dated 17th November, 1764. The type-locality is therefore restricted to the vicinity of Barnaul.

No locality is given by Gmelin (*loc. cit.*) for his *Sciurus striatus* s. *asiaticus*, and, as no reference is made to Laxmann's description, it seems that his description

was based upon material from another locality. Gmelin's description is mainly based upon Pallas's description of *Sciurus striatus* (Nov. Spec. Ord. Glires, p. 378, 1778), who says that this species occurs from the Dvina and Kama River in European Russia throughout the whole of Siberia east to Kamchatka. Pallas had, however, observed this animal himself during his journey at Kitatskaya between Tomsk and Atchinsk (Reise d. versch. Prov. Russ. Reiche, vol. ii. p. 665), and mentions it in the German text by its binomial name. This locality must be taken as the type-locality of Gmelin's animal.

A second reference is to Georgi, It. i. p. 163, but Georgi, who obtained his specimen around Lake Baikal, named them after Pallas. A third reference is to *Sciurus minor virgatus* J. G. Gmelin * (Nov. Comm. Acad. Sci. Petrop. vol. i. p. 344, 1770), but this only gives "per universam Sibiriam copiose versat." I can find no direct reference to it in his 'Journey.' A fourth reference given by both J. F. Gmelin (*loc. cit.*) and Pallas ('Glires') is to the "Born-doeskje," Le Bruyn, It. p. 432 (C. de Brun, 'Voyages en Moscovie,' xi. p. 432, 1718).

De Brun obtained his specimens of the "Born-doeskje" near Archangel, and, although a plate is given and there can be no doubt that his animal was a chipmunk, his description is not scientific, and Pallas's definite reference is to be preferred in restricting the type-locality. A list of all valid names given to this animal before 1850 is appended :—

Eutamias sibiricus Laxmann.

Sciurus sibiricus Laxmann, Sibirisches Briefe, p. 69 (1769) (Barnaul, Siberia).

(*Sciurus*) *striatus* s. *asiaticus* J. F. Gmelin, Linn. Syst. Nat. 13th ed. vol. i. p. 150 (1778) (Kitatskaya, between Tomsk and Atchinsk, Siberia).

(*Myomys*) *lineatus* Siebold, Spic. Fauna Japon; in Diss. Hist. Nat. Jap. p. 13 (1824) (Yezo, Japan).

Sciurus uthensis Pallas, Zoograph. Rosso-Asiat. vol. i. p. 189 (1831) (Uth (Uda) River, East Siberia).

* Johann George Gmelin, uncle of Johann Frederic (author of the 13th ed. of Linnaeus's 'Systema Naturae.')

BIBLIOGRAPHICAL NOTICES.

British Grasshoppers and their Allies; a Stimulus to their Study. By MALCOLM BURR. Pp. xvi+162, 6 pls.; text-illustr. London: Philip Allan & Co., 1936. Price 6s.

SIXTEEN years ago the Ray Society published 'A Monograph of the British Orthoptera,' by the late Mr. W. J. Lucas, which drew the attention of many British entomologists to an order of insects generally neglected by collectors. As a result, a great deal of information has been accumulated, and this little book by a well-known authority on the group supplements rather than replaces Lucas's work. It gives keys for the determination of all the species with useful notes on habits and distribution, and brings the nomenclature up to date. A valuable feature of the book is the series of forty outline maps showing by counties the recorded distribution of the species in the British Islands, and bringing out very clearly the gaps still existing in our knowledge. It is to be hoped that this convenient little handbook will serve the purpose stated on the title-page, and act as a stimulus to the study of the British Orthoptera and Dermaptera.

The Birds of Tropical West Africa. By D. A. BANNERMAN. Vol. IV. Pp. xl+459, 14 coloured plates and map; text-illustr. London: The Crown Agents for the Colonies, 1936. Price 22s. 6d.

MR. BANNERMAN's account of the birds of Tropical West Africa, of which the fourth volume has now been published, has already taken an important place among standard ornithological works, and the earlier volumes are in the hands of all who are interested in African birds. The new volume fully maintains the high level of its predecessors. It begins the account of the Passerines, the only order remaining to be dealt with, but one that will require two more volumes for its completion. In this order, with its multitude of families and genera separated by intangible characters and hard to define, Mr. Bannerman's illustrated key to the genera is more than ever indispensable for all except the most experienced ornithologists. The descriptions are clearly and methodically drawn up and, together with the numerous coloured and black-and-white illustrations, give all the assistance that can be given for the identification of species. Perhaps the most valuable part of the work, however, lies in the notes on habits and distribution, for which the author has drawn not only on his own experience, but also on the field-observations of a large number of correspondents whose help is acknowledged in the preface. These notes constitute a mine of information on the ecology of the species dealt with.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 110. FEBRUARY 1937.

XIV.—*Studies of Mexican Fossil Foraminifera.* By
R. WRIGHT BARKER, M.A., F.G.S., and THOMAS F.
GRIMSDALE, B.Sc.*.

[Plates V.-IX.]

	Page
I. On the Presence of an Interseptal Canal-system in <i>Mio- gypsina</i> Sacco	161
II. <i>Pseudolepidina</i> , a new Genus from the Eocene of Mexico ...	169
III. A new Alveolinellid from the Upper Cretaceous of Mexico...	173

I. ON THE PRESENCE OF AN INTERSEPTAL CANAL- SYSTEM IN *MIOGYPSINA* SACCO.

Abstract.

Canals are shown to be present in the three subgenera of *Miogypsina*, and the descent of *Miogypsinoidea* from *Rotalia* is postulated. The subfamily *Miogypsininae* is transferred from the Orbitoididae to the Rotaliidae, and a tabular classification of part of the latter family appended.

INTRODUCTION

While examining specimens of *Miogypsina* (*Miogypsinoidea*) *complanata* Schlumberger from the Meson formation (Middle to Upper Oligocene) of eastern Mexico, an example broken in the equatorial plane was seen to

* Published by permission of the Bataafsche Petroleum Maatschappij and of the Compania Mexicana de Petroleo "El Aguila."

possess clearly marked hollow canals in several of the radial septa of the spiral portion of the test (Pl. V. fig. 6). This discovery led to a critical examination of other available species of *Miogypsina* and, further, to a means of demonstrating the presence of canals so clearly as to place their existence beyond reasonable doubt. Many exact equatorial sections were prepared, with disappointing results, until it was discovered that sections cut near the floor of the equatorial layer invariably showed a more or less definite canal-system in the spire surrounding the nucleoconch in two species, while canals were observed and photographed in the walls of the flange chambers in these and a third species.

In this study *Miogypsina* is regarded as divisible into three subgenera, viz.: *Miogypsina* Sacco sensu stricto, *Miogypsinoidea* Yabe & Hanzawa, and *Miolepidocyclina* Silvestri, the distinction depending on the position of the nucleoconch and the presence or absence of lateral chambers.

Canals can now be demonstrated in all three subgenera, based on a study of the following species:—

- Miogypsina* (*Miogypsina*) cf. *irregularis* (Michelotti).
- (*Miogypsinoidea*) *complanata* Schlumberger.
- (*Miolepidocyclina*) *mexicana* Nuttall.

Genus MIOGYPSINA Sacco, 1893.

Miogypsina (*Miogypsinoidea*) *complanata* Schlumberger.
(Pl. V. fig. 6; Pl. VI. figs. 1–6, 8; Pl. VII, fig. 1;
Pl. VIII. fig. 6.)

- 1900. *Miogypsina complanata* Schlumberger, Bull. Soc. géol. France, sér. 3, vol. xxviii. p. 330, pl. ii. figs. 13–16; pl. iii. figs. 18–21.
- 1933. *Miogypsina complanata* Schlumberger; Nuttall, Journ. Pal. vol. vii. p. 176, pl. xxiv. figs. 9, 11, 13, 14 (not 7).

The external resemblance of young examples of this species to certain ornate types of *Rotalia*, such as *R. byramensis* Cushman, *R. mexicana* Nuttall, *R. mexicana* var. *mecatepecensis* Nuttall, three forms very closely related to one another, and *R. viennoti* Greig, led the authors to suspect a connection between them. Furthermore, thin sections of *Miogypsinoidea* frequently revealed traces of structures resembling canals, serving to increase these suspicions. Conviction came with the observation

of distinct hollow channels in the radial septa of the broken specimen referred to earlier, and full proof is now presented in the photographs of decalcified canada balsam preparations (Pl. VI. figs. 1-4, 6).

In order to obtain these, specimens known to be unfilled by sediment or by crystalline matter were impregnated, first with chloroform, then with canada balsam; these were sectioned in the usual manner and finally decalcified with dilute hydrochloric acid (Heron-Allen, 1894; Hofker, 1927). The preparations were mounted in glycerine for photographing.

A brief account of the observed characters of the canal-system follows:—In the initial spire of the test, which is slightly trochoid and has its ventral umbilicus filled with a plug of clear shell substance, a spiral canal can be recognized, from which spring offshoots passing into, and along, the radial septa. At the distal terminations of these septa, any one canal may (a) pass to the exterior, or (b) form a labyrinth of canals in the outer wall, or (c) bifurcate, the two branches entering either into separate radial septa of the outer whorl, or into the septa of the equatorial net, where they form an interwoven mesh with the branches from other septa. Nothing comparable to the "marginal cord" of the Camerinidæ has been observed.

The similarity of the system of canals in the initial spire of *Miogypsinoidea* to that figured by Hofker (1927, pls. xvi., xix., xxi.) in various recent species of *Rotalia*, together with other resemblances to be noted below, is in the opinion of the authors sufficiently conclusive evidence of direct relationship between the genera. The full discussion of the phylogeny is reserved, however, until the evidence for canals in *Miogypsina sensu stricto* and *Miolepidocyclus* has been presented.

Miogypsina (*Miogypsina*) cf. *irregularis* (Michelotti).
(Pl. V. figs. 4, 5, 7-10; Pl. VII. figs. 2, 3.)

References to *Miogypsina irregularis* are as follows:—

1841. *Nummulites irregularis* Michelotti, Mem. Soc. Ital. Sci. Modena, vol. xxii. p. 296, pl. iii. fig. 5.
1900. *Miogypsina irregularis* (Michelotti) Schlumberger, Bull. Soc. géol. France, sér. 3, vol. xxviii. p. 328, pl. ii. figs. 1-7, 9, 10; pl. iii. fig. 17.

Since no proper description nor figures have been published for this species in the Western hemisphere (with the exception of a description by Tobler as *Mio-gypsina* sp., Eclog. geol. Helvet. vol. xix. 1926, pp. 719-722; Neogene of Trinidad) the following notes are given on specimens from the equivalent of the Meson formation, near Coatzintla, Veracruz :—

Test small, rather irregular in outline, varying from ovate to subtrigonal; the megalospheric form sometimes shows an irregular, almost lobate periphery along the margin opposite to the embryonic apparatus. In cross-section the test is irregularly lenticular, the greatest thickness being towards the apical embryonic apparatus; in the megalospheric form one side is frequently more convex than the other, which may be nearly flat. The surface is strongly papillate, the papillæ becoming smaller and more numerous towards the edge of the test away from the embryonic apparatus, and ranging in diameter from minute to $100\ \mu$. The microspheric form is slightly larger and flatter, and is usually broader than long, the reverse being commonly found in the megalospheric form. The embryonic apparatus is apically placed, forming a projecting umbo at the edge of the test. The papillæ are more numerous, slightly smaller, and of a more uniform size than in the megalospheric form. Diameter 1.2-2.0 mm. (megalospheric form) up to 2.4 mm. (microspheric form); thickness, 0.7 mm. (megalospheric form). The microspheric form is comparatively rare.

Equatorial sections show the median layer to be composed of rhomboidal chambers, averaging about $100\ \mu \times 80\ \mu$; the nucleocoenoh is apically situated and consists of two subequal cells followed by a spiral portion of from eight to twelve rectangular chambers of larger size than the succeeding chambers of the median layer. The initial embryonic chamber is circular in section, with a diameter of $95\ \mu$ - $100\ \mu$ (excluding the cell-walls); the second chamber is subcircular in section, the entire apparatus (including the walls) measuring $200\ \mu$ to $225\ \mu$.

Transverse sections show the presence of numerous pillars, thickest at the surface, where they terminate in papillæ; their development seems to be somewhat irregular and not as strong as figured by Schlumberger for *M. irregularis*. There are several tiers of rather irregular

lateral chambers, about five in number at the thickest part of the test in most sections. The median layer averages 100μ in thickness. All sections show the hemispherical nature of the lateral chambers, and the ovoid type of median chamber.

This species seems to belong to the group of American species which includes *M. staufferi* Koch, *M. cushmani* Vaughan, *M. hawkinsi* Hodson, *M. venezuelana* Hodson, *M. bracuensis* Vaughan, and *M. bramlettei* Gravell. It is highly probable that *M. antillea* (Cushman) should be included in this group, but the species is obscure, owing to the poor description and figures. Vaughan (1926) identified specimens of *Miogypsina* from Coatzintla as *M. antillea*, but in the absence of a detailed description, and of type material, the authors prefer to omit comparison with this form.

All the species mentioned show an apical or subapical embryonic apparatus followed by a variable number of larger chambers in a spiral. *Miogypsina* cf. *irregularis* shows a greater number of such spiral chambers than any of the others except *M. bramlettei* Gravell, which it closely resembles in other respects, but it may be distinguished by the absence of pillars from the latter species. *M. staufferi* shows many more median chambers, and the nucleocoenoch is situated further from the periphery. *M. venezuelana* and *M. hawkinsi* do not show very marked spirality, nor does *M. cushmani*, although *M. hawkinsi* is similar in other respects. Of the species described from other parts of the world, close similarity may be noted to *M. irregularis* and *M. globulina* (Michelotti), the latter probably being synonymous with the former. The resemblance to the figures of *M. irregularis* given by Schlumberger is very close, but as the descriptions are lacking in detailed measurements the Mexican specimens have been left as *M. cf. irregularis* (Michelotti). It is possible that *M. bramlettei* is only a variety in which pillars have not been developed. *M. cf. irregularis* differs from *M. bracuensis* Vaughan in the smaller nucleocoenoch and the more marked spirality of the early chambers.

As all of the available material is infilled with matrix, Canada balsam preparations could not be made; consequently the evidence for canals rests entirely upon thin sections. However, in certain instances the canals are

very readily seen, infilled with darker material than the chamber walls; and since they occupy the same position with regard to the median layer and show a similar distribution pattern to *Miogypsinoidea*, there is no reason to doubt their authenticity. A ring or spiral canal encircles the first chamber of the nucleoconch, with radiating canals in the septa of the spire: the system continues throughout the median layer as a net of canals in the chamber walls. No canals have been observed in the lateral layers.

Note.—Canals may be observed also, with considerable clarity, in the published figures of sections of *M. (Miogypsina) kotoi* Hanzawa (see Hanzawa, 1935, pl. iii. figs. 34, 37). *M. kotoi*, which now includes *M. ozawai* Hanzawa (*loc. cit.*), belongs to the *M. irregularis* group, and the figures mentioned seem to show a similar canal-system to that found in *M. cf. irregularis*.

Miogypsina (Miolepidocyclina) mexicana Nuttall.

(Pl. VII. fig. 4; Pl. IX. fig. 6.)

1933. *Miogypsina mexicana* Nuttall, Journ. Pal. vol. vii. p. 175, pl. xxiv. figs. 1-6, 8, 10, 12.

Repeated attempts were made to impregnate hollow specimens with balsam; and in a few examples portions of a canal-system were observable in balsam preparations. Unfortunately the canals were for the most part infilled with other matter, and none of the portions noted can be illustrated satisfactorily. Thin sections, however, showing canals in the walls of the equatorial chambers, provide sufficiently convincing proof of their presence.

Having now established the existence of interseptal canals in *Miogypsina*, and having discussed as far as is possible at present the pattern of the canal-system, it remains to enlarge upon the connection between *Miogypsinoidea* and *Rotalia*, already briefly referred to. A few notes on the latter genus are interpolated, however; first, in order to define the position adopted by the authors as to what is included in *Rotalia* (a position liable to change as a result of further work on the genus), and, secondly, to draw attention to characters in certain species of *Rotalia* which are regarded as adumbrating *Miogypsinoidea*.

Genus *ROTALIA* Lamarck, 1804.

The alleged absence of canals in *Rotalia trochidiformis* Lam., the genotype (Davies, 1932, p. 408), is contradicted, in the present authors' opinion, by the figures of that species published in the same work (*loc. cit.* pl. ii. fig. 15; pl. iii. fig. 11). Hence it is reasonable to regard the following species as congeneric with the type:—

- Rotalia byramensis* Cushman.
- *mexicana* Nuttall.
- — var. *mecatepecensis* Nuttall.
- *polystomelloides* (Parker & Jones).
- *pulchella* d'Orbigny.
- *schroeteriana* Parker & Jones.
- *viennoti* Greig.

Rotalia viennoti Greig shows traces of canals in the published figures (1935, pl. lviii. figs. 5, 7, 13), though no mention of a canal-system is made by the author; this species is clearly very closely allied to the *Rotalia byramensis* group. That the recent species included in the above list possess well-developed canal-systems is fully demonstrated by Hofker (1927, pp. 35–42, and plates).

Rotalia mexicana var. *mecatepecensis* Nuttall.
(Pl. VI. fig. 7; Pl. IX. figs. 7–9.)

1932. *Rotalia mexicana* Nuttall var. *mecatepecensis* Nuttall, Journ. Pal. vol. vi. p. 26, pl. iv. figs. 11, 12.

Thin sections of the species here figured demonstrate the presence of an apparently normal "Rotaline" canal-system. They further show small subsidiary chambers, incompletely septate, near the periphery of the test at the distal ends of radial septa; these chamberlets, visible in both median and transverse sections, are strongly suggestive of the first rank of equatorial chambers in *Miogypsinoides* and *Miogypsina* sensu stricto, occupying a similar position in relation to the chambers of the spiral portion of the test. Subsidiary chambers also appear to be present in *Rotalia viennoti* (Greig, *loc. cit.* pl. lviii. figs. 5, 7, 13, 14) in a similar position, but without comparative material this cannot be stated with certainty.

PHYLOGENETIC CONCLUSIONS.

Summarising the resemblances between *Rotalia* and *Miogypsinoides* we have :—

ROTALIA.	MIOGYPSINOIDES.
Test a trochoid spire.	Initial spire trochoid.
Umbilical plug present.	Umbilical plug present.
Peripheral subsidiary chambers.	Equatorial chambers developed.
Complex ornament. of knobs and ridges, characteristically arranged.	Complex ornament of knobs and ridges.
Spiral canal, with radial branches bifurcating distally. No marginal cord.	Spiral canal, with radial branches bifurcating distally. No marginal cord.

Upon the above evidence is based the hypothesis that *Miogypsinoides* is directly descended from *Rotalia*, a form like *R. viennoti* or *R. byramensis* being transitional. This evolution took place probably in the Middle Oligocene, and was rapidly followed by the appearance of *Miogypsina sensu stricto* and *Miolepidocyclina*; acquisition of lateral chambers, reduction of the initial spire, and migration of the nucleoconch away from the periphery being the major changes successively involved. A further gradational change may be observed in the size of the canals, those of *Rotalia* and *Miogypsinoides* being noticeably greater in width than those of *Miogypsina* and *Miolepidocyclina*. This cannot be checked by measurements until decalcified preparations of all the subgenera are available.

The above is the reverse of the order of evolution postulated by Galloway (1933, p. 422), though he gives no evidence in support of his view. Such stratigraphical evidence as the authors possess is, however, in favour of the opinion put forward here.

In view of the marked differences between typical *Rotalia* and typical *Miogypsina*, the subfamily Miogypsininæ is retained, but it has to be transferred from the Orbitoididæ (by definition lacking a canal-system) to the Rotaliidæ. Phyletic classification would then be as follows :—

ROTALIIDÆ Reuss.	ROTALIIINÆ Schultz.	ROTALIA Lamarck.
	MIOGYPSININÆ Vaughan.	MIOGYPSINA Sacco sensu lato.
MIOGYPSINA Sacco sensu lato.	{	
	MIOGYPSINOIDES Yabe & HANEWA.	
	{	
	MIOGYPSINA Sacco sensu stricto.	
	{	
	MIOLEPIDOCYCLINA Silvestri.	

II. *PSEUDOLEPIDINA*, A NEW GENUS FROM THE
EOCENE OF MEXICO.*Abstract.*

A new genus of "Orbitoidal" foraminifera, with one species, is described and figured: its distinction from previously described genera is indicated.

INTRODUCTION.

Associated with *Helicostegina gyralis* Barker & Grimsdale at its type-locality (Barker & Grimsdale, 1936), specimens externally resembling *Lepidocyclina* were observed, and thin sections were prepared with a view to identifying the species. These revealed characters sufficiently novel to exclude it from all published genera, though it bears resemblance to many. All the specimens have been assigned to a single species, here named *Pseudolepidina trimera*, gen. et sp. n., upon which is founded the following provisional diagnosis.

PSEUDOLEPIDINA, gen. nov.

Genotype: *P. trimera*, sp. n.

Test small, lenticular, composed of three zones of chambers, as in *Lepidocyclina*, but less clearly differentiated from one another. Most specimens exhibit a degree of asymmetry, one lateral zone being thicker and having better-developed pillars than the other. The nucleoconch, which lies almost centrally, consists of two chambers surrounded by a common wall; they are subequal, and in the equatorial plane. A third chamber, which perhaps should be included as part of the nucleoconch, is large and partially embracing, and lies to one side of the equatorial plane (see fig. 2), apparently always occurring on the less convex side: one or more smaller supplementary chambers, intermediate in character between the embryonic and the equatorial chambers, seem to form a rough spiral around the nucleoconch: from the position of these chambers and their apertures, as seen in sections, it would appear that the spiral is oriented at right angles to the equatorial plane, rather than in it as is seen in *Polylepidina* and other "orbitoid" genera.

Except near the nucleoconch the equatorial zone consists of a double layer of chambers, irregularly arcuate in form, connected by stoloniferous passages to four adjacent chambers—two of the preceding and two of the succeeding annulus. The chambers are also connected by long stoloniferous passages with the chambers of the lateral layers, with which they sometimes appear to be continuous (see fig. 1). In fact, transverse sections show the equatorial zone to be formed apparently by interlocking of the extremities of the layers of lateral chambers, in a manner entirely distinct from that seen in other orbitoidal genera. The distinction is further emphasized by the arrangement of the lateral chambers in layers rather than in tiers.

It will have been gathered from the preceding account that *Pseudolepidina*, though bearing a general resemblance to many of the genera assigned to the Orbitoididæ, differs in certain respects from all of them; the principal distinctions being (1) the form of the nucleoconch and adjacent chambers, (2) the duplication of chambers in the equatorial zone, and (3) the latter's structural connection with the lateral zones. Thus (1) and (2) serve to separate the genus from *Lepidorbitoides*, *Actinosiphon* (which possesses, in addition, radial stoloniferous passages apparently lacking in *Pseudolepidina*), *Eulinderina*, *Poly-lepidina*, *Helicolepidina*, most species of *Lepidocyclina*, and *Miogyssina*: (3) further differentiates the genus from most of *Lepidocyclina*, and from *Pseudorbitoides* and *Vaughanina*, the two last having an entirely distinct structure in the equatorial zone and *Vaughanina*, at least, possessing a well-developed canal-system. From *Orbitoides*, to which its similarity is closer, it differs in the absence of a common wall enclosing the chambers of the nucleoconch.

The nearest related forms are certain species of "*Lepidocyclina*," not yet properly defined, which show the same structural relation between equatorial and lateral zones, with duplication in the former, associated, however, with a bilocular nucleoconch of normal "*Isolepidine*" type: these species will have to be removed from *Lepidocyclina* when a full examination of their characters has been carried out, but here no account of them can be given.

Fig. 1.



Fig. 2.

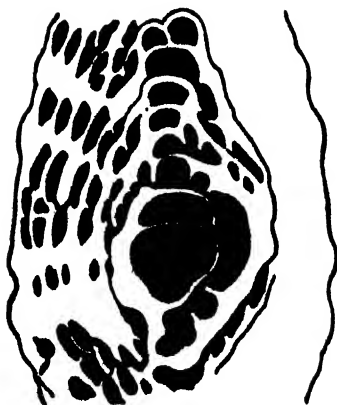


Fig. 1.—Part of a transverse section of *Pseudolepidina trimera*, sp. n.,
 × 100, showing the interlocking of the lateral zones to form
 the median zone. (R. W. B. del.)

Fig. 2.—Part of a transverse section of *Pseudolepidina trimera*, sp. n.,
 × 50, showing the spiral form of the embryonic apparatus.
 (R. W. B. del.)

Pseudolepidina cannot, in the authors' opinion, be classed in the family Orbitoididæ, since it shows characters at variance with those of the family as accepted by most workers. Its position is for the present left uncertain, owing to the lack of published work on forms most nearly related.

Pseudolepidina trimera, sp. n.

(Pl. V. figs. 1-3; Pl. VIII. figs. 1-5.)

Since the genus is based on a single species, the specific description merely recapitulates that given for the genus, so this repetition is largely omitted. In order to define the species as accurately as possible, the following dimensions and data are added:—

Test small, lenticular, papillate; average diameter 2.6 mm., maximum diameter 3.7 mm.; average thickness 0.9 mm. Initial chamber of nucleocoach (average of maximum internal diameters) 195μ ; second chamber $155\mu \times 80\mu$. The third chamber outside the equatorial plane measures $240\mu \times 55\mu$. The height of the equatorial zone near the centre varies from 110μ to 160μ , near the periphery from 175μ to 240μ , all measurements including floor and roof; the height of the individual chambers near the centre being greater than that of those near the periphery, where the increased height of the equatorial zone is due to duplication. The equatorial chambers in median section are irregular both in form and size, being roughly arcuate, and having a radial diameter varying from 25μ to 70μ , and a tangential diameter from 40μ to 115μ ; they are separated by walls, generally thick, but varying in thickness from 10μ to 110μ . The pillars seen in transverse sections thicken towards the surface of the test, where they have a diameter up to 160μ , averaging 100μ .

Horizon and Locality.—*Pseudolepidina trimera* was found first in the lower part of the Middle Eocene, in association with *Eulinderina semiradiata* Barker & Grimsdale, at Goldschmid Station No. 837, close to the village of Yecuatla, State of Veracruz, Mexico. Also found at Jenny Station No. 1573, five kilometres E.S.E. from Sabaneta, State of Veracruz; Sabaneta lies about 33 kilometres S.W. of Papantla, Veracruz. There it is present in abundance, associated with *Helicostegina*

gyralis Barker & Grimsdale. This latter locality has been selected as the type, and the horizon is known to be near the base of the Middle Eocene.

III. A NEW ALVEOLINELLID FROM THE UPPER CRETACEOUS OF MEXICO.

Abstract.

The occurrence of larger foraminifera in the Cárdenas beds of Mexico is briefly discussed, followed by a description of a new species, *Borelis cardenasensis*.

INTRODUCTION.

The Upper Cretaceous beds exposed in the railroad cuttings near Cárdenas, State of San Luis Potosi, on the Tampico-San Luis Potosi railway line, have been described by Böse and Burckhardt (1906, 1930), while H. Douvillé, in 1927, described *Lepidorbitoides minima* from this locality, this being the first accurate record of foraminifera from these beds. J. J. Galloway (1928) described the same species as *Polylepidina cardenasensis*, and in the following year Vaughan (1929¹) noted the synonymy of these species and altered the generic designation to *Orbitocyclina*, a new genus. In 1935 the species was referred to the original genus, *Lepidorbitoides*, by M. G. Rutten (1935), after further detailed work both on this species and on *Lepidorbitoides* from the Chalk of Maastricht. In Cuba (Palmer, 1934) the same form occurs with *Meandropsina*? *rutteni* Palmer, *Vaughanina cubensis* Palmer, and species of *Asterorbis*. Of these, *Meandropsina*? *rutteni* occurs in the Cárdenas beds, and *Vaughanina cubensis* occurs in a similar assemblage elsewhere in Mexico. Apart from the work mentioned, little has been published on foraminifera from the Cárdenas beds.

In 1934 the authors visited the locality near Cárdenas with a view to collecting material of *Lepidorbitoides minima* Douvillé and such other foraminiferal material as might be obtained. Beds rich in *Lepidorbitoides*, associated with *Meandropsina*? *rutteni*, were found, and at a higher horizon a calcareous, sandy shale was discovered, crowded with a small globular Alveolinellid, somewhat resembling *Borelis melo* (Fichtel & Moll).

This was sectioned and found to differ markedly from any described species, though showing superficial resemblance to several species of *Borelis*; it has been placed temporarily in this genus, though later work may necessitate its removal. A description follows:—

BORELIS Montfort, 1808.

Borelis cardenasensis, sp. n.

(Pl. IX. figs. 1–5.)

Test small, subspherical, usually about 1.0 mm. in diameter, but attaining a maximum of 1.5 mm.; thickness 0.8 mm. to 1.0 mm., being about two-thirds to four-fifths of the diameter. Slight umbilical depressions are generally visible at opposite poles of the test. Externally the test resembles other species of *Borelis*, with interrupted spiral striations on weathered specimens corresponding to spiral septa.

Internally the test consists of a triloculine embryonic apparatus, followed by a coiled, chambered spire, each whorl completely overlapping the earlier whorls; the axis of coiling is not, however, fixed, but rotates constantly with the addition of fresh whorls in such a way that the orientation of a section changes from whorl to whorl. This suggests rather a milioline tendency, in accordance with the form of the nucleocoench.

The last whorl consists of six or seven chambers, divided into chamberlets by spiral septa; these chamberlets are arranged in two tiers, separated by incomplete transverse septa at right angles to the spiral septa; the last stage of some specimens may show an incipient third tier, somewhat similar to *Alveolinella*. The tiering is intermittent throughout the test, but becomes more regular as the whorl height increases. The whorls are seen to be about six in number, though this is somewhat obscured by the shifting of the axis, and range in height from about 50 μ near the centre to 130 μ near the periphery.

The diameter of the proloculum of the triloculine embryonic apparatus averages about 100 μ , and appears to be fairly constant. No microspheric individuals were observed, and the post-septal and pre-septal canals described by Bakx (1932) and others were not seen.

GEOLOGICAL HORIZON.

The Cárdenas beds were first ascribed to the Senonian by Böse, but later it was realised that they were younger, and this was confirmed by the discovery, by the authors, of specimens of *Sphenodiscus lenticularis* (Owen) (identification confirmed by Dr. C. Burckhardt), which placed the age as Campanian-Maastrichtian. Foraminifera from shales slightly higher in the succession show the age to be approximately that of the Navarro of South Texas.

DISCUSSION.

If we consult the text-books of Cushman (1933) and Galloway (1933) we are led to place the species described above in *Flosculinella*, since, as defined in those works, it is the only genus in the family with the primary chambers subdivided into two rows of secondary chamberlets (*Alveolinella* showing multiple subdivision). Van der Vlerk (1922) and Bakx (1932) have come to the conclusion that *Flosculinella* is a synonym of *Alveolinella* Douvillé, so that following this classification the species becomes *Alveolinella cardenasensis*. The chief argument of Bakx and van der Vlerk is that *Flosculinella* may show more than two rows of secondary chamberlets in the final whorl (as shown in the present species). A careful study of the works mentioned and of a discussion by Yabe and Hanzawa (1929), however, brings us to the conclusion that *Flosculinella* appears to be a valid genus, differing from the present species in the presence of a regular division of each primary chamber into two tiers, the chamberlets in the outer one much smaller and more numerous than those of the inner one, whereas subdivision is intermittent in *B. cardenasensis*, and the chamberlets are equal to subequal in size in the two tiers.

In *Alveolinella* the test is fusiform rather than sub-spherical, and the chambers show well-marked multiple subdivision. A rather closer relationship is shown to *Præalveolina* Reichel (1933), but this is also a Cretaceous form, so that apparent similarity may be due to a similar primitive stage in two different lineages.

This leaves us with *Borelis*, with which the species agrees in the general shape and appearance, the possession of a triloculine embryonic apparatus, and a tendency

towards milioline coiling with shifting of the axis (see Galloway, 1933, pp. 147, 150; Yabe & Hanzawa, 1929, p. 180). There remains a difference, however, in the subdivision of the chambers into chamberlets in *cardenasensis*, a character not noted, so far as the authors are aware, in *Borelis*, but this is not considered sufficient reason for the immediate erection of a new genus for the present species.

It seems probable that Galloway may be right in suggesting a relationship between *Borelis* and *Fabularia*, since the present early species of *Borelis* shows many affinities with *Fabularia*, the principal differences being that the latter shows only two final chambers and possesses a more marked milioline coiling. In the absence of further data and comparative material the species is left as *Borelis cardenasensis*.

Vaughan (1929²) has described somewhat similar species from Jamaica, but the marked subdivision of the chambers in *B. cardenasensis* is sufficient to distinguish it from *B. matleyi*, and the greater number of whorls and larger proloculum of *B. jamaicensis* and its variety *truncata* preclude identity with this species, though Vaughan figures, but does not refer to, incipient subdivision in *B. jamaicensis* (op. cit. pl. xl. fig. 7). Some of the sections of *Fabularia* figured by Cole and Ponton (1934) show marked similarities, but, as has been pointed out, there is no reason to consider *B. cardenasensis* as a *Fabularia*.

LITERATURE.

- BAKK, L. A. J. 1932. "De genera *Fasciolithes* en *Neovalveoline* in Het Indo-Pacifische Gebied." Verh. Geol. Mijnb. Gen. Ned. en Kol., Geol. Ser., Dl. ix. pp. 205-266, pls. i.-iv.
- BARKER, R. WRIGHT, & GRIMSDALE, T. F. 1936. "A Contribution to the Phylogeny of the Orbitoidal Foraminifera, etc." Jour. Pal. x. pp. 231-247, pls. xxx.-xxxviii.
- BÖSE, E. 1906. "La Fauna de Moluscos del Senoniano de Cárdenas, San Luis Potosí." Inst. Geol. Mexico, Bol. no. 24, pp. 1-95, pls. i.-xviii.
- BURCKHARDT, C. 1930. "Etude synthétique sur le Mésozoïque mexicain." Mém. Soc. Pal. Suisse, il. & l.
- COLE, W. STORRS, and PONTON, G. M. 1934. "New Species of *Fabularia*, *Asterocyclina*, and *Lepidocyclina* from the Florida Eocene." Amer. Midland Nat. xv. no. 2, pp. 138-147, pls. i.-ii.
- CUSHMAN, J. A. 1933. 'Foraminifera, their Classification and Economic Use.' 2nd Edition.
- DAVIES, L. MERSON. 1932. "The Genera *Dictyoconoides* Nuttall, *Lockhartia* nov., and *Rotalia* Lamarck." Trans. Roy. Soc. Edinburgh, lvii. pp. 397-428, pls. i.-iv.

- DOUVILLÉ, H. 1927. "Les Orbitoides de la région pétrolifère du Mexique." C. R. Somm. Soc. géol. France, Fasc. 4, pp. 34-5.
- GALLOWAY, J. J. 1928. "Notes on the Genus *Polylepidina* and a new Species." Journ. Pal. i. pp. 299-303, pl. li.
- . 1933. 'A Manual of the Foraminifera.' Indiana.
- GREIG, D. A. 1935. "*Rotalia viennoti*, an important Foraminiferal Species from Asia Minor and Western Asia." Journ. Pal. ix. pp. 523-526, pl. lviii.
- HANZAWA, S. 1935. "Some Fossil *Operculina* and *Miogyxina* from Japan, etc." Sci. Rep. Tôhoku Imp. Univ., 2nd Ser. (Geol.), xviii. no. 1, pp. 1-29, pls. i.-iii.
- HERON-ALLEN, E. A. 1894. 'Prolegomena towards the Study of the Chalk Foraminifera.' London, pp. 1-36.
- HOFKER, J. 1927. "The Foraminifera of the 'Siboga' Expedition. Part I." Siboga-Expeditie, Monog. iv., Livr. cvii., pp. 1-78, pls. i.-xxxviii.
- . 1933. "A new Method of making Slides of Foraminifera," in "Foraminifera of the Malay Archipelago." Vidensk. Medd. fra Dansk. Natur. Foren. Bd. 93, pp. 74-5.
- PALMER, DOROTHY K. 1934. "Some large Fossil Foraminifera from Cuba." Mem. Soc. Cubana de Hist. Nat. viii. no. 4, pp. 235-264, pls. xii.-xvi.
- REICHEL, M. 1931. "Sur la Structure des Alvéolines." Eclog. geol. Helvet. xxiv. pp. 289-303, pls. xiii.-xviii.
- . 1933. "Sur une Alvéoline cénomaniennne du Bassin du Beausset." Eclog. geol. Helvet. xxvi. pp. 269-280, figs. 1-14.
- RUTTEN, M. G. 1935. "*Orbitocyclina* Vaughan, a Synonym of *Lepidoborbitoides* Silvestri." Proc. Kon. Akad. Wetensch. Amsterdam, xxxviii. no. 2, pp. 186-187, 1 pl.
- SILVESTRI, A. 1928. "Intorno all' *Alveolina melo* d'Orbigny (1846)." Riv. Ital. Pal., Anno xxxiv. pp. 17-44, pls. i.-iv.
- VAUGHAN, T. WAYLAND. 1926. "Results of recent Investigations of American Tertiary Larger Foraminifera." Proc. Third Pan-Pacific Sci. Congress, Tokyo, pp. 1850-1857.
- . 1929¹. "Species of *Orbitocyclina*, a new Genus from the Upper Cretaceous of Mexico and Louisiana." Journ. Pal. iii. pp. 170-175, pl. xxii.
- . 1929². "Additional new Species of Tertiary Larger Foraminifera from Jamaica." Journ. Pal. iii. pp. 373-382, pls. xxxix.-xli.
- VLEEK, I. M. VAN DER. 1922. "Studien over Nummulinidae en Alveolinidae." Verh. Geol. Mijnb. Gen. Ned. en Kol., Geol. Ser., Dl. v. pp. 329-464, pls. i., ii.
- YABE, H., & HANZAWA, S. 1927-29. "Tertiary Foraminiferous Rocks of the Philippines." Sci. Rep. Tôhoku Imp. Univ., 2nd ser. (Geol.), xi. no. 3, pp. 137-190, pls. xv.-xxvii. (see pp. 180-181).

EXPLANATION OF THE PLATES.

PLATE V.

- Figs. 1-3. *Pseudolepidina trimera*, gen. et sp. n. Exteriors, $\times 15$.
- Figs. 4, 5, 7-10. *Miogyxina* (*Miogyxina*) cf. *irregularis* (Michelotti). 4, 5. Exteriors, $\times 19$ (Loc.: Chiapas, Mexico). 7. Transverse section, $\times 38$ (Loc.: nr. Coatzintla, Veracruz). 8. Transverse section, $\times 38$ (Loc.: nr. Coatzintla). 9, 10. Equatorial sections, 9, $\times 25$; 10, $\times 29$ (Loc.: nr. Coatzintla).
- Fig. 6. *Miogyxina* (*Miogyxinoidea*) *complanata* Schlumberger. Natural equatorial section, $\times 36$, showing canals. (Loc.: Empire Well No. 2, San José de las Rusias.)

PLATE VI.

- Figs. 1–6.** *Miogypsina (Miogypsinoides) complanata* Schlumberger.
 1–4. Decalcified equatorial sections, to show canals.
 1, 3, 4, 6, all $\times 40$; fig. 2, same section as fig. 4, $\times 110$.
 5, 8. Equatorial sections, 5, $\times 25$; 8, $\times 40$.
 All specimens from Empire Well No. 2, San José de Las Rusias.
- Fig. 7.** *Rotalia mexicana* Nuttall var. *mecatepecensis* Nuttall. Equatorial section, $\times 40$, showing general resemblance to *Miogypsinoides*, and canals. (From Bustos Well No. 1.)

PLATE VII.

- Fig. 1.** *Miogypsina (Miogypsinoides) complanata* Schlumberger; equatorial section, $\times 100$ approx. (same specimen as Pl. VI. fig. 3, before decalcifying).
- Figs. 2, 3.** *Miogypsina (Miogypsina)* cf. *irregularis* (Mich.); 2. Equatorial chambers, with canals in walls, $\times 120$ approx.
 3. Nucleoconch and spiral chambers, with canals in walls, $\times 130$ approx. (Loc.: near Coatzintla, Veracruz.)
- Fig. 4.** *Miogypsina (Miolepidocyclus) mexicana* Nuttall; equatorial chambers, $\times 175$ approx., showing canals (? vestigial) in walls. (Topotype.)

PLATE VIII.

- Figs. 1–5.** *Pseudolepidina trimera*, gen. et sp. n. 1, 5. Equatorial sections, 1, $\times 27$; 5, $\times 25$. 2–4. Transverse sections, 2, $\times 26$; 3, $\times 36$; 4, $\times 32$. (All figures of cotypes.)
- Fig. 6.** *Miogypsina (Miogypsinoides) complanata* Schlumberger. Transverse section, $\times 90$, to show rotaliform coiling. (Loc.: Empire Well No. 2, San José de las Rusias.)

PLATE IX.

- Figs. 1–5.** *Borelis cardenasensis*, sp. n. 1, 2. Transverse sections, $\times 40$ approx. 3, 4. Axial sections, $\times 40$ approx. 5. Exterior, $\times 20$ approx. (All topotypes.)
- Fig. 6.** *Miogypsina (Miolepidocyclus) mexicana* Nuttall. Transverse section, $\times 25$, showing foramen in the nucleoconch. (Topotype.)
- Figs. 7–9.** *Rotalia mexicana* Nuttall var. *mecatepecensis* Nuttall.
 7. Transverse section, $\times 40$. 8. Equatorial section, $\times 40$, showing subsidiary chambers. 9. Equatorial section, $\times 80$.

XV.—*Studien über südostasiatische Calandrinien*
 (Col., Curcul.). Von KLAUS GUNTHER, Dresden.

(Tafel X.)

HERR G. J. ARROW vom British Museum (N.H.) und Sir Guy A. K. Marshall waren so liebenswürdig, mir das südostasiatische Calandrinienmaterial der ihnen unterstellten Sammlungen zur Durcharbeitung anzuvertrauen; es sei ihnen auch hier dafür verbindlichst gedankt. Neben der Feststellung neuer Formen liessen sich auch Erweiter-

ungen unserer Kenntnis über die systematische Stellung schon bekannter Arten dem erwähnten Material entnehmen, beides soll im folgenden bekannt gemacht werden.

RHYNCHOPHORINUS, gen. nov. Rhynchophorinorum.

Rüssel kräftig, nach dem Ende hin zunehmend seitlich comprimiert; beim ♂ mit deutlicher Dorsalfurche, deren Ränder in der distalen Hälfte mit Höckern besetzt sind, am Ende des ♂ Rüssels oben ein aufrechter grosser Zahn. Mandibeln ohne Anhänge. Fühlerwurzeln an der Rüsselbasis. Halsschild mit fast gleichmässig gerundeten Seiten und deutlichem Basallappen. Scutellum sehr lang und lancettlich spitz. Elytren greifen an der Schulter über die Halsschildbasis, sie zeigen je 9 deutliche Streifen, von denen der 4. und 5. und der 6. und 7. miteinander am distalen Elytrenende verbunden sind. Der 10. Streifen ist nur andeutungsweise an der Basis der Elytren feststellbar; neben dem Schildchen verläuft der 1. so überaus dicht an der Naht, dass er nur schwierig von ihr zu unterscheiden ist, erst unmittelbar hinter den Ende des Schildchens entfernt sich der 1. Streifen weit von der Naht, so dass er erst an dieser Stelle zu beginnen scheint. Pygidium decliv, normal, hinten abgeschnitten. Vorderhüften ganz schmal getrennt, nur etwa um die Breite des Fühlerschaftes. Mesepimeren deutlich ansteigend; Metepisternen und Metepimeren breit; 1. und 2. Ventrit nicht verwachsen. Beine kräftig, Schenkel nicht gezähnt; Schienen am Ende mit Haken. 2. Tarsenglied auffällig kurz.

Genustype: *Cercidocerus heros* Pascoe 1887.

Geographische Verbreitung: Sumatra, Malayische Halbinsel.

Die neue Gattung wird wegen der Bildung des Rüssels der zusammen mit den aufsteigenden Mesepimeren, zu den Rhynchophorinen gestellt. Sie hat zwar mit keiner der dort vereinigten wenigen Gattungen nähere Verwandtschaft (in der Rüsselbildung der ♂♂ erinnert sie am meisten an *Omotemnus* Chev.); doch zu einer anderen Tribus der Calandrinæ kann die neue Gattung überhaupt nicht gestellt werden. Die breiten Metepisternen freilich, die Lacordaire für das Hauptcharacteristicum der Tribus Rhynchophorini hält, kommen in gleicher Weise auch den Ommatolampini und den meisten Sphenocorynini zu.

Rhynchophorinus heros Pascoe.

Die einzige Art der Gattung ist in Ann. & Mag. Nat. Hist. (5) xix. p. 377 (1887) als *Cercidocerus* nach einem ♀ von Penang beschrieben und l. c. tab. 11, fig. 3 sehr gut abgebildet. Der Habitus lässt sie sofort aus der Reihe der sonst bekannten *Cercidocerus*-Arten heraus fallen; durch die über die Halsschildbasis greifenden Elytrenschultern, die aufsteigenden Mesepimeren und die sehr charakteristisch verlaufenden 1. Elytrenstreifen ist die Art von *Cercidocerus* generisch verschieden. Mir ist ein solches ♀ von Sumatra aus dem Museum für Tierkunde zu Dresden bekannt, das mit Beschreibung und Abbildung Pascoes genau übereinstimmt. Ausserdem liegen mir aus dem genannten und aus dem British Museum je ein ♂ vor mit den Fundortangaben "Sumatra, Deli" und "Sumatra," deren Rostrum in der oben bei der Gattungsdiagnose angegebenen Weise ausgezeichnet ist. Sie sind beide nicht wie die ♀♀ schwarz, sondern hell olivgrün bis hellgrau tomentiert, bei schwarzer Körpergrundfarbe; die bei den ♀♀ zu beobachtenden weissen Zeichnungen sind bei den ♂♂ nur auf dem Halsschild deutlich, auf ihren Elytren jedoch verschwimmen oder verschwinden sie.

DIE GATTUNG *PRODIOCTES* FAUST (nec PASCOE).

Der Gattungsname *Prodiocetes* wurde von Pascoe aufgestellt für die Art *quinarius* Pascoe, aber auch nicht einheitlich aufgefasst, da Pascoe zugleich generisch abweichende Arten, wie *dehaani* Gyllh., zu *Prodiocetes* gestellt wissen wollte. Faust hat dann später die Gattungen *Anapygus* Kirsch 1876, *Meroplus* Chevr. 1885 und *Pleurothorax* Chevr. 1885 als synonym zu *Prodiocetes* Pascoe aufgefasst und eine grosse Anzahl von Arten dazu beschrieben, worin ihm später Heller folgte. So ist heute eine Fülle von Arten bei *Prodiocetes* Pasc. vereinigt, die einander zwar nahe stehen, aber doch generisch miteinander nicht übereinstimmen; die nächstverwandten Gattungen sind *Sphenocorynus* Schh. und *Tetratopus* Chevr.: *Sphenocorynus* ist durch den sehr kurzen, fast geraden Rüssel, in den meisten Fällen auch durch schmale gestreckte Körperform, *Tetratopus* (? = *Heterotoxus* Lacord. ?) ausserdem noch durch die nach hinten schräg ausgezogenen Ecken des 3. und 4. Ventrites von

den gegenwärtig bei *Prodiocetes* Pasc. vereinigten Arten geschieden. Diese Arten stimmen, wie gesagt, generisch nicht mit einander überein und verteilen sich auf 5 verschiedene Gattungen nach folgendem Schlüssel :

1. Elytrenstreifen nicht punctiert, undeutlich oder fast gar nicht markiert *Prodiocetes* Pasc.
 Hierher nur 1 Art: *P. quinari* Pasc. (Borneo), am meisten und auffälligsten von allen je zu *Prodiocetes* gestellten Species abweichend.
 Elytrenstreifen sehr deutlich punctiert und ausgeprägt, die Punkte oft $\frac{1}{2}$ so breit wie die Spatien oder noch breiter. 2.
2. Pronotum glatt, ohne 2 halbseitlich nach vorn convergierende Leisten oder Kiele, und nicht mit der Länge nach deutlich eingesenkter Scheibe 4.
- Halbschild mit 2 deutlichen halbseitlichen vollständigen oder abgekürzten Leisten oder Kielen, oder jedenfalls mit deutlich der Länge nach eingesenkter Scheibe 3.
3. Halbseitliche Kiele oder Leisten des Halsschildes nur in dessen vorderer Hälfte ausgeprägt, in oder kurz hinter der Mitte erlöschen sie plötzlich und gänzlich. *Anapygus* Kirsch.
 Hierher nur 1 Art; *Anapygus carinicolis* Kirsch (Malaya).
 Halbseitliche Kiele oder Leisten durchziehen den Halsschild bis zum Hinterrande, meist gleichmässig stark und deutlich; sie können auch von der Mitte an zum Hinterrand hin allmählich undeutlicher werden und verlöschen (*P. heydeni* Heller, Neu-Guinea), oder überhaupt völlig undeutlich sein und nur durch den deutlich der Länge nach eingesenkte Halsschildscheibe angezeigt sein (*P. trisignatus* Kirsch, Malaya, Java) *Pleurothorax* Chev.
4. Rüssel der ♂♂ mit 2 Reihen deutlicher Zähne auf der Oberseite, die Zähne in grösseren Abständen von einander. Nur auf Celebes und den Molukken. *Meroplus* Chev.
 Rüssel der ♂♂ durch sehr dicht stehende Puncturen oben unregelmässig rau oder höckerig, aber nicht 2-reihig gezähnt. In Insulinde nicht östlich der Wallaceschen Linie, aber auf den Philippinen und Formosa. Genustype: *Prodiocetes dux* Faust. [gen. nov. *Metaprodiocetes*,

PLEUROTHORAX CHEV. umfasst folgende Arten :

<i>P. eximius</i> Guér. (<i>geminus</i> Fst. ?).	<i>P. pagdeni</i> , sp. n.
<i>P. de haani</i> Gyllh.	<i>P. fallax</i> Fst. (= <i>gemellus</i> Fst.).
<i>P. torridus</i> Pasc.	<i>P. heydeni</i> Heller.
<i>P. kirschi</i> Fst.	<i>P. trisignatus</i> Kirsch (= <i>interjectus</i> Fst.).
<i>P. carinensis</i> Fst.	
<i>P. geminus</i> Fst.	

MEROPLUS Chevr. umfasst folgende Arten :

M. serrirostris Chevr.
M. denticulatus Chevr.
M. alternans Chevr. (= *geniculatus* Chevr.).

? *M. cinereiventris* Chevr.
M. similis Heller.

METAPRODIOCTES K. Gthr. umfasst folgende Arten :

M. duz Faust.
M. tristis Fst.
M. linea nigra Chevr. (= *borneensis* Fst.).
M. formosanus Heller.
M. bellus, sp. n.
M. nigrocinctus Chevr.
M. flavolineatus Chevr.
M. subscutellaris Chevr.
M. rubrovittatus Heller.

M. surigaonis Heller.
M. surigaonis nigripennis Heller.
M. unicolor Heller.
M. frusterferi Faust.
M. haematicus Chevr. (= *singhalensis* Fst.).
M. pavoninus Pasco. (? = *Sphenocorynus tenuirostris* Gthr. ?).
M. sphenocorynoides, sp. n.
M. tenuigriseus, sp. n.

Prodiocetes rubricosus Faust und *P. octopustulatus* Fst. gehören beide zu *Sphenocorynus* Schh. Die in den vorstehenden Listen aufgestellten Synonyme sind neu erkannt und werden hier zum ersten Mal publiciert.

Anapygus carinicollis Kirsch ist mir aus dem British Museum in mehreren Exemplaren von der malayischen Halbinsel bekannt geworden, die von dem Typus nicht abweichen.

Pleurothorax pagdeni, sp. n.

Rotbraun, kein graues Toment in den Puncturen. Halsschild mit schwarzen Längstreifen mitten und an der Seite, mit ganz flachen und breiten, glänzenden und nicht punctierten halbseitlichen Längsleisten; den Raum zwischen ihnen füllt der schwarze Mittelstreifen aus. Elytren mit nur sehr kleinen Puncturen in den Streifen, mit sehr deutlichem, ganz glatten und glänzenden Elytrenkiele (5. Spatium). Keine Spur von schwarzen Schulterflecken, Subapicalflecken vom 3. bis zum 8. Streifen reichend. Ein kleiner schwarzer Flecken befindet sich auf der Basis des 6. Spatiums, das 7. ist an der Basis erhaben und glänzend. Long. rostr. excl. 11, lat. 3.7 mm.

1 ♂, Malaya, Cameron's Highlands, 1500 m., 29. v. 1931, H. T. Pagden leg., Imp. Inst. Ent. (ex Mus. Fed. Mal. St.).

Von den anderen Arten mit gleichmässig kräftigen Halsschildleisten durch die rotbraune Farbe geschieden, wobei graues Toment sich nicht einmal in den Puncturen der Elytrenstreifen findet, hauptsächlich aber durch den gänzlichen Mangel von Humeral- oder Posthumeralmakeln.

Metaprodioces sphenocorynoides, sp. n.

(Taf. X. Abb. 4.)

Schmal, gestreckt, düster rotbraun tomentiert, mit graugelben Tomenttupfen (die auch fast fehlen oder undeutlich sein können) um die nicht sehr dicht angeordneten Puncturen auf Halsschild, Elytren und Körperseiten. Rüssel kräftig gebogen, so lang wie der Halsschild oben, beim ♂ oberseits fast über seine ganze Länge deutlich punctiert, beim ♀ glatt. Antennenschaft länger als Geißel ohne Keule, diese wenig länger als breit, nach dem Ende hin kaum verschmälert, tomentierter Teil bedeutend länger als der chitinierte. Halsschild gewölbt, an der Basis gerandet. Schildchen glänzend. Elytren mit deutlichen Punctstreifen, hinten ein wenig gemeinsam ausgeschnitten. Pygidium mit dicht stehenden Puncturen und Tomenttupfen, gewölbt, hinten abgerundet, nur beim ♂ ein wenig über das 5. Ventrit ragend, am Ende mit doppeltem Borstenbüschel. Unterseite gefärbt wie Oberseite, jedoch die Hüften und 3. u. 4. Ventrit schwarz mit besonders seitlich dichten Puncturen und Tomenttupfen. Schenkel und Schienen an den Streckseiten fast glatt, glänzend; 1. Tarsenglied länger als 2. Long. excl. rostr. 15, lat. 4-6 mm. 2 ♀♀, Tonkin: Than Moi, vi., vii., Fruhstorfer leg., Mus. f. Tierkunde, Dresden und Dtsch. Ent. Institut, Berlin-Dahlem (Cotypen); 1 ♂, Assam, Patkai Mts., Doherty leg., British Museum (Paratype, schlecht erhalten).

Aehnelt dem dichter punctierten, weniger deutlich hell getupften *Sphenocorynus rubricosus* Faust.

Metaprodioces bellus, sp. n.

(Taf. X. Abb. 1.)

Der vorher beschriebenen Art sehr ähnlich, durch den Habitus, besonders die vorspringenden Schultern und die in der hinteren Hälfte concav verlaufenden Halsschildseiten, abweichend, in den Einzelheiten der Färbung aber mit *M. sphenocorynoides* übereinstimmend. Hellere Exemplare zeigen kleine schwarze Schulterflecken auf den Elytren. Long. excl. rostr. 12-2-15, lat. 4-6-5-2 mm.

In der Gestalt *M. lineanigra* Chevr. oder *M. formosanus* Heller ähnlich, variiert in der Färbung und Fleckung nach ihren Fundorten.

Holotypus : 1 ♀, Assam, Nagas, Doherty leg., British Museum ; Paratypen : 3 ♀♀, Kambodja, Kampong Toul, Vitalis de Salvaza leg., Mus. f. Tierkde., Dresden ; 1 ♀, Birma, Karen Hills, Doherty leg., British Museum. Ferner 1 ♂, Assam, Patkai Mts., Doherty leg., British Museum.

Bei den Exemplaren von Kampong Toul und von den Karen Hills sind die Tomenttupfen des Halsschildes kleiner als die der Elytren, das ♂ von den Patkai-Bergen ist sehr dicht punctiert und demgemäss sehr dicht mit hellen Tupfen bedeckt, zumal auch noch die Punkte der Elytrenstreifen mit gelblichem Tomente gefüllt sind ; dies Tier macht einen etwas abweichenden Eindruck.

Metaprodiocetes tenuigrisellus, sp. n.

(Taf. X. Abb. 5.)

Schmal, mit sehr dünnem Rüssel, ähnlich den Arten von *Tyndides* Pascoe. Grundfarbe schwarz, oder tief düster rotbraun, mit grossen und zahlreichen grauen Tomenttupfen um die Puncturen auf Halsschild, Elytren, und Beinen ; Unterseite zusammenhängend grau tomentiert. Rüssel länger als der Halsschild oben, deutlich gleichmässig gebogen.

Fühler tomentiert, Schaft kürzer als Geissel ohne Keule, diese fast doppelkegelförmig, am Ende abgeschnitten, chitinisierter Teil länger als tomentierter. Halsschild oben der Länge nach leicht concav. Schildchen schwarzglänzend ; Elytren mit deutlichen Streifen und schwarzen kleineren Schulter- und grösseren Anteapicalflecken, die von zusammen hängenden Tomentringen eingefasst sein können. Pygidium stumpf gekielt, mit borstenbesetzten Puncturen, stumpfkegelig über das 5. Ventrit hinaus ragend. Beine mit rotbraun durch die Tomenttupfen schimmernder Grundfarbe. Long. excl. rostr. 11, lat. 3.5 mm.

1 ♂, 2 ♀♀, Nordborneo, Kina Balu, Mus. f. Tierkde., Dresden.

Durch den sehr langen dünnen Rüssel auch vor dem anscheinend ähnlichen *M. pavoninus* Pasc. ausgezeichnet, durch die concave Halsschildscheibe dem *Pleurothorax trisignatus* Kirsch genähert, dem die neue Art auch im

sonstigen Habitus gleicht; der Rüssel des *trisinatus* ist kürzer.

NEUE UND BEKANNTE ARTEN DER
GATTUNG *CERCIDOCERUS* Schh.

Cercidocerus hispidulus pendleburyi, sp. n.

Ober-, Unterseite und Beine olivgrün tomentiert, Halsschild und Unterseite etwas heller als die Elytren; Beine mit gleichmässig verteilten kurzen abstehenden Haaren. Halsschild deutlich weitläufig punctiert, mit 2 länglichen gelben Flecken an der Basis, vor dem 4. Streifen jeder Elytre. Elytren auf dem Nahtspatium und dann alternierend auf dem 3., 5., 7. und 9. Spatium zerstreut punctiert und kontinuierlich etwas heller als die Elytrengrundfarbe; ausserdem mit grossen gelben ca. 1½ mm. langen Flecken am Elytrenvorderrande auf dem Nahtspatium neben dem Scutellum, und auf dem 3. Spatium, ferner ein rundlicher kleinerer Fleck am Ende des ersten Viertels der Elytrenlänge auf 4. und 6. Spatium und hinter der Mitte je ein grosser länglicher Flecken auf dem 2., 4. und 6. Spatium. Diese erwecken den Eindruck einer unterbrochene Querbinde, stehen aber ebenso wie bei der Stammform nicht genau neben einander; kleinere Flecken zwischen den grösseren können auf dem 3. und 7. Spatium dazu kommen. Die deutlich punctierte Unterseite hat gelbe Flecken auf und zum Teil neben den Hüften, auf den Meso- und Metapleuralstücken und den ersten 4 Ventriten, das 5. ist ganz gelb. Long. excl. rostr., 13–15, lat. 5·7–6·8 mm.

3 ♂♂, Perak, Larut Hills, ca. 1500 m., 19. u. 23. ii. 1932, H. M. Pendlebury leg., Imp. Inst. Ent. (ex Mus. Fed. Mal. St.) und Mus. f. Tierkde., Dresden.

Von der Stammform (Penang) durch andere Grundfärbung, hauptsächlich aber durch Zeichnungseigentümlichkeiten geschieden: die Halsschildstreifen der Stammform sind bei der Unterart nur als Basalflecken des Halsschildes erhalten, die ebenso wie die anderen Elytrenflecken leuchtend gelben Vorderrandflecken auf dem Nahtspatium und 3. Spatium fehlen der Stammform, deren Unterseite auch einfarbig weisslich zu sein scheint.

Cercidocerus incertus, sp. n.
(Taf. X. Abb. 7.)

Grosse untomentierte Art, in der Färbung dem *C. chevrolati* Faust sehr ähnlich: die Grundfarbe des Körpers ist schwarz, die Flügeldecken sind ausser an den Rändern, oft aber auch mit Finschluss des Vorderrandes braunrot gefärbt, mit einem vom 1., meist aber 2. bis zum 5. Streifen reichenden schwarzen Medianflecken. Der Halsschild aber ist im Gegensatz zu *C. chevrolati* an den Seitenrändern ebenso wie die Unterseite weiss bereift. Oberfläche schwach glänzend, Rüssel ziemlich dünn, kaum wahrnehmbar punctiert; Fühlerschaft länger und Keule des ♂ breiter als die Fühlergeissel lang ist. Halsschild mitten der Länge nach eingesenkt mit deutlichem Mittelkiel und jederseits von ihm sehr grober Punctierung, die nach den Seitenrändern hin schwächer wird, und sich schon, bevor sie diese erreicht, fast ganz verliert. Elytrenspatien eben, nicht punctiert; Pygidium stark abfallend, gewölbt, aber nicht gekielt, deutlich und dicht, aber nicht grob punctiert, hinten abgerundet. Prothoraxseiten deutlich, aber nicht grob punctiert, Körperunterseite und Beine fein punctiert, die letztgenannten mit grauen Schüppchen oder zum Teil Börstchen in den Puncturen, sonst schwarzglänzend. Long. rostr. excl. 13–14, lat. 5.2–5.8 mm.

2 ♂♂, Birma, Momeit, Doherty leg., British Museum und Mus. f. Tierkunde, Dresden; 1 ♀, Allahabad, British Museum.

C. chevrolati Fst. (Java, Sumatra, Malacca) hat keine Andeutung weissen Reifes auf dem Halsschildseitenrande, die Puncturen erreichen den Halsschildseitenrand, die Körperoberfläche ist fast gänzlich tomentiert. Puncturen der Prothoraxseiten und der Körperunterseiten sind bei *C. chevrolati* viel gröber als bei *C. incertus*. Auch gänzlich tomentiert ist der im übrigen ähnlich gefärbt *C. x-rubrum* Desbr. (Philippinen); er hat grössere, vom 1.–7. Elytrenstreifen reichende Medianflecken auf den Elytren, weissen Reif auch längs des Halsschildhinterandes und auf dem Scutellum. Die ♂♂ sind auch durch ihre Forcipes sehr verschieden; bei *C. chevrolati* und *x-rubrum* sind diese zum Ende hin kaum verbreitert und nicht breiter als die Rüssel am distalen Ende, bei

C. incertus aber ist der Forceps distal sehr verbreitert und dort mindestens $1\frac{1}{2}$ Mal so breit als der Rüssel des Tieres am Ende.

Cercidocerus dohertyi, sp. n.
(Taf. X. fig. 10.)

Der vorher beschriebenen Art und *C. chevrolati* in der Färbung ähnlich, aber schmaler als diese beiden Arten. Grundfarbe, Rüssel und Beine tief dunkelbraun; Halsschild mit breiten Seitenrandstreifen von hellgelbem Toment, zuweilen auch Hinterrand und Mittelkiel mit diesem geziert; gelbes glänzendes Toment auch auf dem Pygidium, vor den Vorderhüften, auf den Meso- und Metapleuralstücken, im vorderen Teil von Meso- und Metasternum und auf den Seiten der Ventrite: alle diese tomentierten Parteen können einen seidigen Glanz haben. Rüssel ziemlich dünn, kaum wahrnehmbar punctiert; Fühlerschaft länger und Keule des ♂ breiter als die Geißel lang ist. Halsschild schwach glänzend, mit stark eingesenkter Scheibe, mit Mittelkiel und sehr dichten groben Puncturen neben ihm, die zum Seitenrand hin schwächer und verstreuter werden. Elytren tomentiert, heller oder dunkler rotbraun, aber Spitzendrittel, Seitenrand und oft auch Naht, sowie ein vom 2. oder 3. Streifen bis an den Seitenrand reichender Medianfleck schwarz; Spatien unpunctiert. Pygidium decliv, grob und zerstreut punctiert, ungekielt; Seiten des Prothorax sehr grob, sonstige Körperunterseite und Beine feiner punctiert, mit kleinen grauen Schuppen in den Puncturen, Beine sonst glänzend. Long. excl. rostr. 10–11·6, lat. 3·6–4·1 mm.

2 ♂♂, Assam: Valley und Patkai Mts., Doherty leg., British Museum, 1 ♂, Assam, Mus. f. Tierkde., Dresden.

Durch schmälere gestrecktere Gestalt und das gelb tomentierte Pygidium von der vorher beschriebenen Art, sowie von *C. chevrolati* und *C. x-rubrum* verschieden. Es liegt ein weiteres Exemplar vor (♂, Assam Valley, Doherty leg., British Museum), das die rotbraunen Elytrenparteen glänzend zeigt und auch auf dem Pygidium kein Toment hat; dieses ist vollkommen schwarz und sehr stark glänzend. Doch gehört dies Exemplar sicher auch zu dieser Art.

Cercidocerus paraprodiotooides, sp. n.

Aehnlich dem *C. prodiotooides* Heller (Borneo, Sarawak), kleiner. Ober- und Unterseite tomentiert oder bereift, auch die Schenkel an der Seite. Halsschild schwarz, Elytren fast schwarz mit je einem sich undeutlich abhebenden grossen tiefschwarzen Medianfleck und einer ihn nach hinten, zuweilen auch nach der Seite begrenzenden dunkelroten Partie. Pygidium fast schwarz, ebenso Unterseite, diese mit grauem Reif, Beine tief dunkel rotbraun, mit grauem Toment in den zerstreuten Puncturen.

Rüssel kräftig; Fühlerschaft so lang, Keule der ♂♂ so breit wie die Fühlergeissel lang ist. Halsschild in hinteren Teil breit wie die Fühlergeissel lang ist. Halsschild in hinteren Teil breit eingesenkt, mit unpunctierter aber nicht erhabener Mittelleiste und kräftigen nicht in einander verfliessenden, nach dem Rande hin an Stärke abnehmenden Puncturen. Streifen der Elytren deutlich, kein Spatium an der Elytrenbasis erhaben. Pygidium hinten abgerundet, erst sanft, im letzten Viertel dann plötzlich stark abfallend, so dass es von der Seite her wie vor dem Ende aufgetrieben anmutet. Beine glänzend, mit zerstreuten tomentgefüllten Puncturen; 1. Tarsenglied doppelt so lang wie 2. Long. excl. rostr. 9–10, lat. 3·6–4 mm.

4 ♂♂, Sarawak, Shelford leg., 1 ♂, Perak, Doherty leg., British Museum u. Museum f. Tierkde., Dresden; 1 ♂, Selangor, Bkt. Kutu, 1100 m., iii. 1931, 1 ♂, Kina Balu (Kamborongah, 1000–1300 m.), iii. 1929, H. M. Pendlebury leg., Imp. Inst. Ent. (ex Mus. Fed. Mal. St.).

Ferner liegt noch vor ein übereinstimmendes aber grösseres ♂ (long. 12, lat. 4·5 mm.) von Selangor, Bkt. Kutu, 1100 m., iii. 1931; ich stelle es auch zu dieser Art. *C. prodiotooides* Heller 1908 stimmt mit der neuen Art in Körpergestalt und in der Schmalheit der Fühlerkeule der ♂♂ überein, auch in der Gestalt des Pygidiums, ist aber grösser mit dunkelrotem Halsschild und fast ganz roten Elytren, und mit hinten sehr breit gerundetem, fast gerade abgeschnittenem Pygidium. Der Forceps des ♂ ist bei *C. prodiotooides* am Ende sehr stark verbreitert, fast so wie das 3. Tarsenglied und am Ende so breit wie dieses am Ende; bei *C. paraprodiotooides* ist der Forceps nach dem Ende hin nicht verbreitert und deutlich schmaler als das 3. Tarsenglied am Ende.

Cercidocerus viduus Chevr.

Von dieser Art liegen mir aus dem British Museum 4 ganz gleichartige ♂♂ Exemplare vor, 2 aus Kambodja, 1 aus Siam, 1 aus Java?, die der Beschreibung genau entsprechen, aber einen ziemlich breiten weissen Tomentstreifen auch längs des Halsschildmittelkieses zeigen.

UEBER ARTEN DER GENERA *BELORRHINUS* GUÉR.,
ZETHEUS PASC. UND *TYNDIDES* PASC.

Belorrhinus Guér., Icon. Règne An., Insectes, 1838, p. 177.

Megaproctus Schönh., Gen. Spec. Curc., iv. p. 868 (1838).

Oxypygus Lacord., Gen. Col. vii. p. 281 (1866).

Die Genustype für diese Gattung ist *B. acutus* Fabr., deren Deutung mir nicht möglich ist. Die für diese Art angegebenen 4 weissen Längsstreifen auf dem Halsschilde sind mir nur von *B. ocellatus* Guér. bekannt; doch ist dieser nicht schwarz, wie *acutus* beschrieben wird, sondern ist braun, und nicht die Elytrennaht ist weiss, wie sie es bei *acutus* sein soll, sondern das Spatium zwischen 3. und 4. Elytrenstreifer. Es ist nicht deutlich, ob die Gyllenhallsche Redescription von *acutus* nach dem Typus, oder ob sie nach anderen Exemplaren gemacht ist; vielleicht handelt es sich bei *acutus* um die Sumatraform des *ocellatus*; diese Art ist mir von Sumatra nicht bekannt. Die Species *B. exclamationis* Wied. beansprucht wahrscheinlich auf Grund ihres stark gebogenen Rüssels eine neue Gattung, zu der auch *B. affinis* zu stellen wäre. Ob die nachstehend beschriebenen Formen wirklich alle den Wert guter Arten haben, darüber bin ich mir nicht ganz klar; vielleicht verhalten sich manche zu einander wie geographische Rassen.

Belorrhinus ocellatus Guér.

Mit der Beschreibung genau übereinstimmende Stücke finden sich ausser auf Java auch auf Borneo; daneben sind mir von Ost-Java Exemplare bekannt, bei denen die äusseren der weissen Halsschildstreifen in dicht stehende Tomentpunkte aufgelöst sind.

Belorrhinus vicinus, sp. n.

Von gleicher Grösse und ähnlicher Färbung wie *B. ocellatus*; Grundfarbe am Halsschild und in der vorderen

Elytrenhälfte dunkler braun nur 2 nach hinten divergierende weisse Tomentstreifen auf dem Halsschilde. Elytren mit weisslichem Toment in den Puncturen der Streifen, aber ohne weisse Tomentflecken in der Längsrichtung zwischen diesen Puncturen, mit schwarzer Naht und Anteapicalmakel, aber ohne weisse Streifen auf irgend welchen Spatien. Seiten des Thorax und der ersten Ventrite schwarz. Rüssel der ♂ gekörnelt mit zumindest an der Basis deutlichem Längskiel. Long. rostr. excl. 10, lat. 2·2 mm.

2 ♂, 1 ♀, Martapura, Südostborneo, Doherty leg. 1881, British Museum und Mus. f. Tierkde., Dresden.

Von *ocellatus* durch an Halsschild und vorderer Elytrenhälfte dunklere Grundfarbe geschieden, durch den Mangel weisslicher Streifen an den Halsschildseiten und auf irgendwelchen Elytrenspatien und durch die tomenterfüllten Puncturen der Elytrenstreifen, während in der Längsrichtung zwischen diesen Puncturen keine weissen Flecken sich befinden, wie dies bei *ocellatus* der Fall ist.

Belorrhinus shelfordi, sp. n.
(Taf. X. Abb. 8.)

Grösser als die beiden besprochenen Arten, vor allem deutlich breiter, sonst in Färbung Zeichnung und Habitus dem *B. ocellatus* Guér. gleichend. Halsschild fast schwarz, mit 4 weisslichen Längsstreifen und mit von weissen Toment erfüllten Puncturen. Elytren mit schwarzem Naht- und weissem 2. Spatium, deutlich punctierten Streifen, deren Puncturen von Toment erfüllt sind. Die schwarzen Anteapicalflecken sind sehr gross, sie beginnen mit dem 3. Spatium. Körper seitlich und unten dicht zusammenhängend gelblich tomentiert; Beine braun, mit grossen gelblichen Tomenttupfen. Long. rostr. excl. 11·2–12·5, lat. 3·2–4 mm.

2 ♀♀, "Borneo" und Sarawak, Mus. f. Tierkde., Dresden, 1 ♂, Südsumatra, Mt. Tanggamaes, Kolonie de Giësting, 500 m., xii. 32, in Coll. Drescher, Bandoeng-Java, ferner Exx. in Cambridge Zool. Mus.; 1 ♂, Quop, Westsarawak, British Museum.

Das letztgenannte Tier ist schlecht erhalten. Durch bedeutendere Grösse und besonders Breite von den vorher erwähnten Arten ausgezeichnet, ferner durch die grossen Anteapicalflecken der Elytren. Das mit der

Fundortsbezeichnung "Borneo" und das ♂ von Java sind besonders lebhaft gefärbt, und auf ihren Elytren sind die Spatien alternierend schwarz und dunkelbraun.

Belorrhinus rarus, sp. n.

(Taf. X. Abb. 9.)

Aehnlich im Habitus dem *B. ocellatus*, wenig grösser. Grundfarbe hellrotbraun, mit grossen gelbbraunen Tomenttupfen in den Puncturen. Rüssel gerade, nicht länger als bei *ocellatus*, beim ♂ in der Basalhälfte deutlich gekörnelt, aber ohne Mittelkiel. Halsschild mit 2 nach hinten etwas divergierenden Mittelstreifen aus weisslichem Toment, die zwischen diesen liegende Partie ist schwarz, wenn auch in gleicher Weise wie der übrige Halsschild mit gelbbraunen Tomenttupfen, die sich in den groben Puncturen befinden, bedeckt; Elytren mit schwarzer Naht, doch kann das Nahtspatium nach aussen zusammenhängend gelbbraun gesäumt sein. Die Punctstreifen mit groben Puncturen, die mit gelbbraunem Toment gefüllt sind, je ein kleiner schwarzer, von hellem Toment eingefasster Anteapicalfleck vorhanden. Pygidium lang und spitz wie bei den anderen Arten der Gattung, mit dichten tomentgefüllten groben Puncturen. Unterseite wie Oberseite gefärbt, mit zusammenhängendem dünnen Toment bedeckt, in dem sich die dichteren Tomenttupfen der Puncturen deutlich abheben. Beine rotbraun, dicht punctiert. Long. excl. rostr. 12·5, lat. 3 mm.

1 ♂, Nordostborneo, Mus. f. Tierkde., Dresden, 1 ♀, Kina Balu, Whitehead leg., British Museum.

Am nächsten verwandt mit *B. vicinus*, sp. n., vor ihm eigentlich nur durch sehr viel hellere Grundfarbe und bedeutendere Grösse ausgezeichnet.

Belorrhinus longirostris, sp. n.

(Taf. X. Abb. 2.)

Im Habitus ähnlich den anderen hier beschriebenen *Belorrhinus*-Arten, von ihnen allen sofort durch die beträchtliche Rüssellänge unterschieden. Grundfarbe düster rötlichbraun. Rüssel fast doppelt so lang wie der Halsschild, dünn, kaum merklich gebogen, beim ♂ in der basalen Hälfte deutlich gekörnelt. Halsschild mit

groben, von weisslichem Toment erfüllten Puncturen, mit schwarzem nach hinten verbreiterten Mittelstreifen, der beiderseits von etwas dichter als sonst stehenden Tomenttupfen gesäumt ist; weissliche Längsstreifen aber wie bei den anderen Arten treten nicht auf. Elytren mit groben Puncturen in den Streifen; doch sind nicht diese Puncturen, sondern wie bei *ocellatus* die in der Längsrichtung zwischen ihnen liegenden Stellen mit weissen Tomentflecken versehen. Nahtspatium schwarz, im übrigen kein Spatium von der Grundfarbe abweichend; verwaschene Anteapicalflecken vorhanden. Pygidium sehr lang und spitz, grob punctiert und mit Borsten in den Puncturen. Seiten des Pronotum mit undeutlichem schwarzen Längsstreifen, innerhalb dessen die Puncturen etwas weniger deutlich als auf dem Halsschild selbst mit Toment gefüllt sind; Unterseite bis auf die letzten Ventrite sehr dicht mit Tomenttupfen besetzt. Beine rotbraun mit dicht stehenden Tomenttupfen. Long. rostr. excl. 13, lat. 2.7 mm. 1 ♂, Nordostborneo: Bettotan, Sandakan, 7. viii. 1927, Imp. Inst. Ent. London (ex Mus. Fed. Mal. St.).

Der lange Rüssel wird sich vielleicht bei Kenntnis weiterer Exemplare als sehr variabel in seiner Länge heraus stellen. Durch die Tomenttupfen der Elytren, die nicht in den Puncturen, sondern in der Längsrichtung zwischen ihnen sich finden, steht die neue Art nur *B. ocellatus* unter den bekannten Species nahe; von ihm aber ist sie sofort durch den Mangel an weissen Längsstreifen auf Halsschild und Elytren zu unterscheiden.

Belorrhinus pugionatus Pascoe.

Von dieser Art liegen mir 1 ♂, 1 ♀ von Nordcelebes aus dem British Museum vor, die einfarbig braunrot sind ohne Tomentflecken oder -Streifen, was für die Elytren wohl als Regel bei dieser Art anzusehen ist. Der Prothorax hat je einen schwarzen Streifen oben in der Mitte und an den Seiten. *B. pugionatus* ist vielleicht durch diesen Mangel an hellen Tomenttupfen und -Streifen von den anderen Arten unterschieden; deutlich allen anderen gegenüber steht er durch den fast völligen Mangel an Puncturen auf dem grösseren Teile der Prothoraxseiten, ferner durch den deutlich, wenn auch ganz flach s-förmig

geschwungenen ♂ Rüssel, der wie bei den anderen (beim ♂) gekörnelt ist auf der Oberseite. Diese Art zu *Tyndides* Pasc. zu ziehen, wie ihr Autor es will (Ann. & Mag. Nat. Hist. (5) xix. p. 380 (1887)), ist unmöglich: *Tyndides* ist durch sehr langen, fast graden Rüssel und abschüssiges, kaum über den 5. Ventrit verlängertes Pygidium charakterisiert.

ZETHEUS Pasc. = *Neoxides* Pasc.

Zetheus Pasc. (Journ. Linn. Soc. xii. p. 69 (1874)) wurde errichtet für die Art *electilis* Pasc. 1874, von Penang, und von *Belorrhinus* Guér. (= *Megaproctus* Schh.) durch Merkmale getrennt, die eine solche Trennung nicht rechtfertigen: "*Megaprocto* congruit, sed scrobibus basalibus, elytris parallelis et femoribus elongatis gracillimis," alles Merkmale die *Belorrhinus* Guér. auch zukommen. Jedoch ist bei *Belorrhinus* der Rüssel der ♂♂ in der basalen Hälfte dicht gekörnelt, bei *Zetheus* aber mit kleinen weit von einander entfernten Höckern besetzt; ferner ist bei *Belorrhinus* der Halsschild nach vorn fast gleichmässig verjüngt und flach, bei *Zetheus* aber in der hinteren Hälfte parallelseitig und deutlich gewölbt.

Neoxides wurde 1887 in Ann. & Mag. Nat. Hist. (5) xix. p. 378 errichtet mit der Art *bilineatus* Pasc. 1887, die höchstens als Subspecies von *Zetheus electilis* Pasc. angesehen werden kann: diese auf Penang ziemlich kurzrüsselige Art ohne weisse nach hinten divergierende Streifen auf dem Halsschild bekommt Andeutungen solcher Streifen in Singapore, und sie zeigt sie deutlich ausgebildet mit längerem Rüssel auf Sumatra oder Borneo. *Neoxides* Pasc. ist also als Synonym zu *Zetheus* Pasc. zu ziehen.

Zetheus minor, sp. n.
(Taf. X. Abb. 6.)

Kleine Art, Grundfarbe rotbraun. Rüssel dünn, deutlich länger als der Halsschild, in der distalen Hälfte leicht gebogen oder, beim ♂, ganz flach s-förmig geschwungen, glatt oder beim ♂ mit weit von einander entfernten Höckern. Fühler an der Rüsselbasis eingelenkt. Schaft kürzer als die Geißel ohne Keule, diese doppelkegelförmig, chitinisierter Teil länger als der tomentierte.

Halsschild hinter der Mitte fast parallelschiff, im vorderen Teile gewölbt, hinten leicht eingedrückt mit zahlreichen von weissem Toment erfüllten Puncturen und je einem sehr schmalen weissen Tomentstreifen nahe dem Halsschildseitenrande; am Seitenrande selbst ein breiter schwarzer Streifen, in dem aber auch die hellen Tomenttupfen sich finden. Elytren kaum breiter als der Halsschild, einfarbig mit undeutlichen kleinen schwarzen Schulter- und grösseren Anteapicalflecken, mit grob punctierten Streifen und nur wenig undeutlichen hellen Toment in den Puncturen; ferner kann der Elytrenvorderrand ganz schmal und zusammenhängend mit grauem Toment gesäumt sein. Pygidium punctiert und mit Toment in den Puncturen, gerade und sehr spitz ausgezogen, ungekielt. Unterseite mit tomentgefüllten Puncturen, 1. Ventrit ganz, 2. und 3. längs dem Hinterrande schwarz. Beine lang, dünn, rotbraun mit tomentgefüllten Puncturen, Schenkel gezähnt. Long. excl. rostr. 8·6–9, lat. 2–2·2 mm.

1 ♂, 1 ♀, Nordost-Borneo: Bettotan, Sandakan, 25. vii., 28. viii. 1927, Imp. Inst. Ent. London (ex Mus. Fed. Mal. St.) und Mus. f. Tierkde., Dresden.

Durch die beiden seitlichen sehr schmalen Tomentstreifen des Halsschildes und die rotbraune Färbung gut characterisierte Art, die hauptsächlich wegen des in weiten Abständen gehöckerten Rüssels des ♂ zu *Zethus* Pasc. gestellt wird.

Tyndides laetus, sp. n.
(Taf. X. Abb. 3.)

Schmale gestreckte Art, Körpergrundfarbe rotbraun, aber an Halsschild, Elytren, Körper und Beinen zusammenhängend grau tomentiert, mit breitem schwarzen Mittelstreifen auf dem Halsschilde und schwarzen kleineren Schulter- und grösseren Anteapicalflecken auf den Elytren. Rüssel ein wenig länger als der Halsschild, dünn, distal von der Fühlerwurzel fast gerade; Fühlerwurzel um die Länge des 1. und 2. Geisselgliedes zusammen von den Augen entfernt. Halsschild zerstreut fein punctiert, das graue Toment um die Puncturen dichter, wodurch dichtere graue Tupfen im übrigen dünneren Toment erscheinen. Scutellum grau tomentiert, Elytrenstreifen grob in Abständen punctiert, Spatien ebenfalls mit Puncten. Pygidium stumpf gekielt, grau tomentiert,

mit tiefen groben Puncturen hinten spitz, nur wenig über das 5. Ventrit hinaus verlängert Unterseite zusammenhängend tomentiert und punctiert, Hüften schwarzglänzend. Schenkel oft nur mit Tomenttupfen um die deutlichen Puncturen, auf schwarzem Grunde. Long. excl. rostr. 10.5–12.5, lat. 3–3.8 mm.

1 ♀, Nordost-Borneo : Bettotan, Sandakan, 24. vii. 1927, Imp. Inst. Ent. London (ex Mus. Fed. Mal. St.), 1 ♀, Nordwest-Borneo : Mt. Sibau, Sarawak, v., vi. 1902, Mus. f. Tierkde., Dresden.

Bei *Tyndides* wegen des weiten Abstandes der Fühlerwurzeln von den Augen.

NACHTRÄGE ZUR BESTIMMUNGSTABELLE DER GATTUNG *SPHENOCORYNUS* SOHH.

Eine Bestimmungstabelle der Gattung *Sphenocorynus* Sohh. ist in Stett. Ent. Zeitung., xcvii. 1936, p. 99, erschienen, einiges ist zu ihr nachzutragen.

Sphenocorynus posthumus, sp. n.

Dunkel rotbraun oder dunkelrot, durchgängig tomentiert. Rüssel sehr kurz und breit am Ende, beim ♀ oben weitläufig punktiert, beim ♂ höckerig. Fühlerkeule unregelmässig trapezförmig, am Ende am breitesten, tomentierter Teil sehr viel länger als der chitinierte. Halschild einfarbig, zur Basis hin deutlich erweitert, mit zerstreuten kleinen, von grauem Toment erfüllten Puncturen, die aber nur in Vergrößerung wahrnehmbar sind. Flügeldecken nach hinten deutlich verjüngt, in den Schultern ziemlich breit, mit 10 Punktstreifen, deren 1. vertieft ist, deren 10. in der Elytrenmitte verlöscht, und mit sehr feiner Punktierung der Spalten, mit einem grossen schwarzen gemeinsamen Flecken hinter dem Skutellum, der jederseits bis fast an den 3. Punktstreifen reicht, und einem schwarzen Flecken dicht hinter der Schulter zwischen 6. und 9. Elytrenstreifen; sonst keine schwarzen Flecken auf den Elytren. Pygidium weitläufig deutlich punktiert, ausser auf einem mittleren Längstreifen, hinten stumpf abgerundet, nicht das 5. Ventrit überragend. Unterseite grösstenteils glatt und glänzend, am Prosternum, den Pleuralstücken der Sterna und den Seiten der Ventrite weitläufig deutlich punktiert; sämtliche Hüften, Mesosternum, Hinterrand des Metasternums,

das Ende der Metepisternen und je 3 Flecken auf dem 3. und 4. Ventrit schwarz. Beine kräftig, glatt und glänzend, Schenkel nicht gezähnt; 1. Tarsenglied beträchtlich länger als das 2. Long. rostr. excl. 16, lat. 5.8 mm.

1 ♂, 1 ♀ "India," British Museum und Museum f. Tierkunde, Dresden.

Die Art ist in der Tabelle am Ende, unter 24, hinter *Sph. rubricosus* Fst. einzureihen; von den beiden dort angeführten Arten (*Sph. distinctus* Gthr. und *Sph. rubricosus* Fst.) ist sie durch grössere Schulterbreite und stärker nach hinten verjüngte Elytren, ferner, ebenso wie von allen anderen bekannten *Sphenocorynus*-Arten, durch die auffällige Zeichnung der rotbraunen Elytren zu unterscheiden, die nur einen grossen gemeinsamen schwarzen Flecken hinter dem Scutellum und je einen schwarzen Humeralflecken zwischen 6. und 9. Punkstreifen aufweisen.

Sphenocorynus minimus K. Gthr.

Diese Art ist nach je einem Stück von Nordost-Borneo und von Sumatra beschrieben, inzwischen haben mir auch Exemplare von der an der Küste Süd-Javas liegenden kleinen Insel Noesa Kambangan vorgelegen (F. C. Drescher leg., 1932, im Museum f. Tierkunde, Dresden, und Coll Drescher). Sie stimmen mit dem Holotypus (von Sandakan) fast vollständig, auch in der Grösse überein; der gemeinsame schwarze Elytrenfleck hinter dem Scutellum ist an der Naht entlang spitz nach hinten ausgezogen.

In einer Anmerkung ist bei der Originalbeschreibung ein grösseres mit Vorbehalt zu *Sph. minimus* gestelltes ♀ erwähnt (Kina Balu), das sich von den Typen durch die bedeutendere Grösse, längeren tomentierten Teil der Fühlerkeule, stärker spitz ausgezogenes Pygidium unterscheidet. Auch bei ihm sind 1. und 2., 3. und 4., 5. und 6. Elytrenstreifen jeweils näher zu einander geordnet; meine entgegengesetzt lautende Angabe l. c. ist irrig. Ein weiteres mit dem genannten völlig übereinstimmendes ♀ liegt mit von Kenokok, Kina Balu, aus dem Fed. Malay St. Museum (H. M. Pendlebury leg.) vor. Schliesslich noch ein 3. ♀ aus dem British Museum (kleiner: long. excl. rostr. 10 mm.) von Sarawak, Mt. Kalulong,

8. xi. 1932, Oxf. Univ. Exped., G. M. Hobby and A. W. More legunt, old secondary forest; dieses Tier gehört spezifisch zweifellos zu den beiden genannten Exemplaren, ist aber unterseits ganz schwarz.

Ob diese grösseren Exemplare mit längerem tomentierten Teil der Fühlerkeule mit Recht zu *Sph. minimus* Gthr. gestellt werden oder ob sie eine eigene Art darstellen, wage ich noch immer nicht zu entscheiden, ich neige der zweiten Ansicht zu.

Sphenocorynus octopustulatus Faust.

Die Beschreibung dieser Art (bei *Prodiocetes* Pasc.) ist nach einem ziemlich grossen Tier gemacht (long. excl. rostr. 13, lat. 4·8 mm.), das nur einen rundlichen schwarzen Flecken in der Mitte der Halsschildscheibe und je einen Flecken an den Pronotumseiten hat. Ein gleiches Stück kenne ich nur aus dem Dtsch. Entom. Inst. Berlin-Dahlem; dort ist als Sammler Wahne angegeben: vielleicht stammen solche Exemplare aus Südost-Borneo.

Die übrigen mir zahlreich aus dem British Museum, dem Fed. Malay St. Museum u. dem Mus. f. Tierkunde, Dresden, bekannt gewordenen Exemplare sind kleiner und schmaler (long. excl. rostr. 9–11·5, lat. 3–4 mm.), im Habitus abweichend und darin *Sph. dyselius* Gthr. gleichend (Stett. Ent. Ztg. xevii. p. 99, fig. 1 (1936)); in der Halsschildmitte haben sie fast stets einen schwarzen Längsstreifen. Im Bau des Forceps aber stimmen sie mit dem Holotypus genau überein.

Sph. fææ dyselius Gthr. (Sumatra), von dem nur 3 ♀♀ vorliegen, ist vielleicht eine Lokalrasse von *octopustulatus* Fst.

Sphenocorynus marginalis Gthr.

Bei Beschreibung dieser auffälligen Art lag nur 1 ♂ von Sumatra vor, inzwischen sind mir 2 Exemplare von Java (Batoeranden, Gg. Slamet, F. C. Drescher leg., in Museum f. Tierkunde, Dresden, und in Coll. Drescher, Bandoeng) bekannt geworden. Sie sind kleiner; long. rostr. excl. 12, lat. 3·5 mm.; im vorderen Teil des Halsschildes ist ein stumpfer Mittelkiel, der nach hinten verlischt, deutlich, jederseits neben ihm ist die Halsschildfläche ein wenig eingedrückt. Angedeutet ist eine solche Bildung auch bei dem Typus.

BESCHRIFTUNG DER TAFELN X.

- Abb. 1. *Metaprodiocetes bellus*, sp. n., ♀ von Nagas, Assam.
 Abb. 2. *Belorrhinus longirostris*, sp. n., ♂.
 Abb. 3. *Tyndides latus*, sp. n., ♀.
 Abb. 4. *Metaprodiocetes sphenocorynoides*, sp. n., ♀ von Than Moi, Tonkin.
 Abb. 5. *Metaprodiocetes tenuigrisellus*, sp. n., ♀.
 Abb. 6. *Zetheus minor*, sp. n., ♂.
 Abb. 7. *Cercidocerus incertus*, sp. n., ♂ von Momeit, Birma.
 Abb. 8. *Belorrhinus shelfordi*, sp. n., ♀ von "Borneo."
 Abb. 9. *Belorrhinus rarus*, sp. n., ♀.
 Abb. 10. *Cercidocerus dohertyi*, sp. n., ♂.

XVI.—Magdalinae (Coleoptera, Curculionidae) de
 l'Amérique méridionale. Par A. HUSTACHE.

LACORDAIRE, dans son 'Genera des Coléoptères' (vi. 1863, p. 572), avait attiré l'attention sur "l'analogie intime" existant entre les genres *Cnemidophorus* rattaché aux Magdalinides et *Lamosaccus*. La méthode qu'il a suivie l'a obligé à les éloigner considérablement, rattachant l'un à ses Synmérides, l'autre aux Apostasimérides (l. c. 1866, p. 11), éloignement qu'il semble regretter, car il ajoute: "Si l'on ne tient pas compte des rapports qu'ont entre elles les hanches antérieures, les *Magdalis*, *Cnemidophorus*, *Lamosaccus*, doivent être placés tous les trois dans le même groupe."

Cette suggestion étant adoptée, les trois genres cités, auxquels plusieurs autres nouveaux sont ajoutés, constituent la sous-famille des Magdalinae, divisée en trois tribus Magdalini, Cnemidophorini, Lamosaccini.

A signaler, pour n'y point revenir, un caractère commun à tous les insectes de cette sous-famille: les squamules ne sont pas simples, mais profondément, bi-, trifides ou pectinées, particulièrement celles du dessous du corps; souvent aussi, les Cnemidophorini ont une pulvéulence fugace, analogue à celle des *Lixus*.

Les genres *Carcilia* Roel. du Japon et *Adistus* Fairm. de Madagascar ont été rattachés, le 1er aux Pissodinæ, le 2e aux Derelominæ †.

† L'étude indispensable des types m'a été rendue possible par les communications des Muséum de Stockholm, Halles a. S., Londres, Dresde, et c'est pour moi un agréable devoir d'adresser mes bien vifs remerciements à MM. A. Roman, W. Ludwig, G. Arrow, K. Günther, qui me les ont transmis au nom de leur Muséum respectif.

MAGDALINÆ.

Mandibules très courtes, en tenailles. Yeux transversaux, plus ou moins rapprochés en dessus. Prothorax sans lobes oculaires, bisinué à sa base, ses angles postérieurs aigus. Un écusson. Elytres allongées, laissant le pygidium à découvert. Fémurs graduellement en massue, les tibias fortement onguiculés, leurs corbeilles ouvertes, les ongles simples, parfois dentés chez *Magdalis*. Méta-sternum assez allongé, la saillie intercoxale postérieure triangulaire; deuxième segment ventral peu plus court que les deux suivants ensemble, sa suture avec le 1er arquée.

Tableau des groupes et des genres.

1. Tibias grêles, non comprimés, au sommet tronqués presque perpendiculairement à leur axe, la corbeille courte. Pygidium simple, entier chez les deux sexes. Epipleures de largeur moyenne. Rostre peu différent suivant les sexes. Elytres régulièrement striés, les interstries plans ou convexes, ponctués. Prothorax en avant rétréci, mais non ou faiblement tubuleux. (MAGDALINI.) 2.
- Tibias comprimés, leur ongllet fort, les antérieurs au moins, à leur angle interne avec un petit denticule et un pinoeau de soies. Pattes antérieures plus longues et plus robustes que les autres, les fémurs dentés, les antérieurs plus fortement. Pygidium simple chez la ♀, divisé en deux segments chez le ♂. Elytres avec le calus antéapical ordinairement distinct. Prothorax brusquement rétréci et tubuleux en avant 3.
2. Hanches antérieures contiguës. Scrobes linéaires *Magdalis*.
- Hanches antérieures étroitement séparées. Scrobes s'élargissant en arrière, pouvant loger le scape en entier, tangents au bord inférieur des yeux. Segments intermédiaires de l'abdomen à leurs extrémités assez fortement arqués. Base du prothorax et des élytres subtronquées *Neomagdalis*, gen. nov.
3. Hanches antérieures contiguës, les intermédiaires étroitement séparées. Prosternum non échancré en avant. Episternes du métathorax de largeur moyenne. Base du prothorax modérément bisinuée, les lobes de la base des élytres grands, mais largement arrondis et peu avancés. Antennes ordinairement grêles, leur massue ovale ou oblongue et moins longue que le funicule. (ONEMIDOPHORINI.) 4.

- Hanches antérieures largement, les inter-médiaires très largement séparées, la saillie intercoxale postérieure triangulaire. Prosternum en avant court et faiblement échancré. Episternes métathoraciques ordinairement très larges, leurs bords sub-parallèles. Scrobes linéaires, dirigés sous les yeux. Tibias antérieurs larges et fortement comprimés. Corbeilles tarsales postérieures obliques. Pygidium vertical, grand, en triangle curviligne, simple chez la ♀, partagé en deux segments chez le ♂. Rostre : ♀ cylindrique, luisant ; ♂ plus court, plus épais, plus ou moins comprimé et densément ponctué, mat, jusqu'au sommet. Antennes courtes, la massue grosse, oblongue, aussi longue, ou plus longue, rarement un peu moins longue que le funicule. (*LÆMOSACCINI*.) 6.
4. Scrobes linéaires, latéraux, commençant vers le milieu ou le tiers antérieur du rostre, obliques, dirigés sous la tête. Tibias postérieurs à leur sommet tronqués presque perpendiculairement à leur axe, la corbeille tarsale très courte, leur ongle fort. Forme subcylindrique, les élytres non ou très peu élargis en arrière. 5.
- Scrobes fovéiformes vers l'insertion antennaire, passant brusquement en dessous en devenant linéaires, mais paraissant prolongés latéralement jusque vers les yeux†. Tibias postérieurs obliquement tronqués à leur sommet, leur corbeille tarsale longue, souvent ascendante et ciliée *Apocnemidophorus*, [gen. nov.]
5. Pygidium grand, chez le ♂ divisé en deux segments peu inégaux. Scrobes en arrière restant éloignés de l'angle inférieur de l'œil. Antennes médianes, les deux premiers articles du funicule allongés et peu différents de longueur. Rostre cylindrique, chez le ♂ un peu moins long et plus densément ponctué que chez la ♀. *Unemidophorus* [Schoenh.]
- Pygidium petit, très peu découvert. Scrobes dirigés en arrière contre le bord inférieur de l'œil. Antennes insérées vers le tiers antérieur du rostre, le scape atteignant le milieu de l'œil, le 1er article du funicule presque aussi long que les 2e et 3e ensemble [subgen. nov.] *Falsocnemidophorus*,
6. Base du prothorax échancrée par les deux lobes avancés de la base des élytres. Trois segments intermédiaires de l'abdomen coupés carrément en arrière *Læmosaccus* Schoenh.

† Le scape des antennes logé dans le scrobe est par suite dirigé en dessous du rostre et non latéralement. Le prolongement latéral du scrobe, dénommé par abbreviation "sillon antéoculaire," est d'autant plus court que l'insertion antennaire est plus rapprochée de la base.

Base du prothorax largement arrondie et échan-
crée seulement près des angles postérieurs,
ces derniers plus ou moins saillants
et aigus. Segments intermédiaires de
l'abdomen arqués à leurs extrémités.
Episternes métathoraciques moins larges.
Type : *L. subsignatus* Boh. Tasmanie.
Espèces australiennes

[gen. nov.
Neolsemosaccus,

MAGDALINI.

Tribu ne renfermant que les deux genres suivants :

MAGDALIS Germ.

Ce genre a des représentants dans toute l'Europe,
le nord de l'Afrique, le Caucase, le Turkestan, l'Asie
Mineure, l'Inde, la Sibérie, l'Altai, le Japon, le Canada
et les Etats Unis, l'Australie (*Lea*) †.

De l'Amérique du Sud ont été décrites :

Magdalis carnifex. Brésil.

— *lanquida* Boh. l. c. vii. 2, 1843, p. 143 †. Brésil.

Les *M. carnifex*, *pipitzi*, *bicristata*, sont rattachés ici
au genre *Apocnemidophorus*.

Dans son ensemble le genre est dispersé dans les
régions tempérées ou froides de l'Ancien et du Nouveau
continent.

NEOMAGDALIS, gen. nov.

Genre ayant les plus grandes affinités avec le précédent,
n'en différant essentiellement que par la non-contiguité
des hanches antérieures. Il ne comprend que les deux
espèces suivantes du versant occidental des Andes :

Noir, mat, les élytres sans calus antépical ni im-
pression postérieure *unicolor* Blanch.

Elytres jaunes, avec la suture et une tache apicale
noires *luteipennis*, sp. n.

Neomagdalis **unicolor* Blanch. in Gay, Hist. Chil. v.
p. 395, t. 25, f. 3 (*Læmosaccus*).

Chili, type au Muséum de Paris.

Chile : Vina de Mar, Concon, Falagante (*C. Porter*),
ma collection.

Sans localité précise, diverses collections.

† N'en ayant pas de cette région je ne puis rien dire des espèces de
Lea.

‡ Type, collection Germar (*Halle*), non vu. D'après la description
serait peut-être un vrai *Magdalis*.

Neomagdalis luteipennis, sp. n.

♀. Allongé, mat, noir, les élytres jaunes, leur suture et une tache apicale et transversale noires.

Rostre aussi long que le prothorax, presque droit, en avant légèrement dilaté ; fovéolé en dessus de l'insertion antennaire, luisant, assez densément ponctué. Front très étroit, fovéolé dans sa partie supérieure, les yeux grands et peu convexes. Tête conique, alutacée, ses points espacés, petits et pourvus d'une microscopique soie. Antennes insérées en avant du milieu du rostre, robustes, le 1er article du funicule conique, aussi long que les deux suivants réunis, le 2e plus long que large, conique, les suivants plus courts, la massue oblongue fusiforme et aussi longue que les 6 articles précédents ensemble.

Prothorax transversal, les côtés modérément arqués jusqu'au resserrement antérieur, ce dernier large mais peu brusque, la base très légèrement sinuée de chaque côté du faible et tronqué lobe médian, les angles postérieurs droits ; convexe, criblé de points assez profonds, un peu confluent.

Écusson noir.

Elytres un peu plus larges à la base que le prothorax, subparallèles ; convexes, les stries étroites, profondes, leurs points serrés, les interstries convexes, avec des hachures transversales, serrées, équidistantes ; dans la tache apicale noire les stries creusées, les interstries granulés, déchiquetés, vus de haut denticulés, les denticules du bord apical plus forts et moins serrés. Pygidium petit.

Pattes élancées ; tous les fémurs avec une dent, celle des antérieurs plus longue, en forme d'épine. Tibias pourvus au sommet interne d'une longue épine, rousse ainsi que l'onglet. Tarses élancés, le 1er article beaucoup plus long que les deux suivants ensemble. Hanches antérieures très étroitement séparées.

♂. Rostre plus court, front encore plus étroit. Antennes plus courtes, le 1er article à peine de moitié plus long que large, les articles 3e et suivants globuleux.

Long., ♂ 5 mm., ♀ 6.5 mm.

Equateur : Loja (*Dr. Ohaus*), une paire, Muséum de Dresde.

CNEMIDOPHORINI.

Par la contiguité de ses hanches antérieures, la conformation des antennes, la sculpture dorsale, l'absence d'échancrure au bord antérieur du prosternum, cette tribu se rapproche plus des Magdalini que des Læmosaccini; avec cette dernière elle a en commun les fémurs dentés, le prothorax tubuleux en avant, le pygidium chez le ♂ grand et partagé en deux segments, les tibias antérieurs au moins plus ou moins fortement comprimés.

Elle ne comprend que deux genres : *Cnemidophorus* et *Apocnemidophorus*; ce dernier a été subdivisé en plusieurs sous-genres basés principalement sur des caractères sexuels secondaires, conformation du rostre, des antennes, du pygidium, mais plusieurs des espèces n'étant connues que par l'un des sexes il n'était pas prudent d'élever ces groupes au rang de genre.

CNEMIDOPHORUS Schoenh.

Schoenh. Gen. et Spec. Curc. iii. 1836, p. 276; Lacord. Gen. Col. vi. 1863, p. 571.

Tête convexe sur le vertex, globuleuse; rostre vertical. Antennes médiocres, assez robustes; scape un peu arqué, épaissi à l'extrémité, atteignant à peine les yeux; funicule de 7 articles obconiques, les deux premiers un peu allongés, le 1er plus gros, les suivants très courts, très serrés, le 7e contigu à la massue, cette dernière assez forte, allongée et acuminée. Yeux grands, oblongo-ovales, transversaux. Prothorax transversal, brusquement tubuleux en avant, fortement convexe. Ecusson assez grand. Elytres assez allongées, obtusément calleux avant leur extrémité qui est tronquée et largement arrondie, pas plus larges que le prothorax et chacun fortement saillant à sa base. Pattes courtes robustes; fémurs dentés en dessous; tibias comprimés, les antérieurs un peu arqués, tous fortement onguiculés à l'extrémité et avec une petite dent apicale interne, opposée à l'onglet; tarses médiocres, spongieux en dessous, le 3e article beaucoup plus large que les précédents, le 4e long ainsi que ses ongles. Segment ventral 2e aussi long que les 3e et 4e réunis, séparé du 1er par une suture arquée. Métasternum muni de chaque côté d'une saillie près des hanches postérieures.

Insecte ailé et faiblement pubescent en dessus.

Le génotype *C. fasciculatus* Bohem. a les tibias dentés au milieu en dedans, caractère qui ne peut être considéré comme générique, se retrouvant dans la 2e mais non dans la 3e espèce de ce genre.

Tableau des espèces.

- | | |
|--|---|
| <p>1. Tibias dentés au milieu en dedans. Dent des fémurs antérieurs petite et aiguë. Prothorax fortement bisinué à sa base et sillonné au milieu. Yeux séparés seulement par une étroite ligne</p> <p>2. Tibias en dedans non dentés au milieu, mais dans leur tiers apical légèrement dilatés en une lamelle étroite et translucide, plus large chez le ♂. Dent de tous les fémurs obtuse et assez longue. Prothorax non sillonné mais étroitement caréné au milieu, sa base subtronquée. Elytres avec deux impressions transversales sur le disque. Long. 7-8 mm.</p> <p>2. Tibias crénelés denticulés en dedans entre la dent médiane et le sommet. Rostre légèrement arqué. Prothorax avec ses côtés parallèles de la base au milieu. Elytres à pubescence éparse, en arrière condensée et formant au moins une macule jaune de pubescence plus longue. Long. 5-8 mm.</p> <p>Tibias non denticulés en dedans. Rostre très droit. Prothorax avec ses côtés arqués. Elytres pourvus de deux séries transversales de fascicules noirs. Long. 4-5-6 mm.</p> | <p><i>impressipennis</i>, sp. n.</p> <p><i>fasciculatus</i> Boh.</p> <p><i>atrofasciculatus</i>, sp. n.</p> |
|--|---|

*Cnemidophorus fasciculatus** Bohem. in Schoenh. Gen. Spec. Curc. iii. 1936, p. 276 (♀).

Oblong, brun de poix, les élytres marrons, revêtu en dessous de squamules jaunâtres, peu serrées sur le milieu, serrées sur les côtés, très serrées sur les flancs du prothorax, en dessus avec quelques squamules sur le prothorax, particulièrement le long de la base et sur les côtés, les élytres subglabres, mais chacun avec une petite tache de longs poils jaunes vers le tiers postérieur des interstries 3-6.

Rostre luisant, à ponctuation fine et peu serrée (♀) ou très serrée, avec une étroite ligne médiane élevée, mat (♂). Prothorax gibbeux, son sillon médian profond, très densément et très finement granulé. Ecusson squamulé. Elytres avec les séries internes fines, les latérales plus

fortes, les interstries plans, transversalement et finement rugueux, le calus postérieur noirâtre.

Long. 5-8 mm.

Rio de Janeiro, type (♀).

Le type m'a été obligeamment communiqué par M. le Dr. A. Roman.

Prov. de Goyaz : Jatahy, six spécimens (ex *Donckier*).

Les élytres ont encore, parfois une ou deux petites taches jaunes, formant avec la plus grande une fascie transversale interrompue.

Cnemidophorus atrofasciculatus, sp. n.

Oblong, subcylindrique, noirâtre, le revêtement squamuleux sur le prothorax jaunâtre, dense sur les côtés et sur les flancs, irrégulier sur le disque, sur les élytres, blanchâtre et dense sur la moitié antérieure, jaune sur la base des deux premiers interstries et autour des fascicules noirs, ces derniers disposés en deux séries transversales, la 1ère submédiane de 3-4 fascicules (sur les interstries 2-5), la 2e vers le tiers postérieur, de 4-5 fascicules plus gros (interstries 2-7), le sommet du 5e interstrie avec un petit tubercule rugueux, non fasciculé. Ecusson élevé et blanc. Dessous à revêtement très dense, brun, sur le milieu du métasternum et la face inférieure des fémurs cendré.

Rostre très droit, presque aussi long que le prothorax (♀), plus court (♂), très densément pointillé jusqu'au sommet, avec une fine ligne médiane un peu élevée. Tête mate, glabre sur le vertex, avec une petite tache squamuleux jaune dans l'angle supérieur des yeux.

Prothorax arrondi sur les côtés, les angles postérieurs aigus ; gibbeux, très densément et finement granulé, le sillon médian léger et squamulé, de chaque côté, avant le milieu, avec une légère impression transversalement ovale et densément squamulée ; tubulure apicale médiocre.

Elytres de un tiers plus longs que larges, s'élargissant légèrement en arrière, derrière la base largement et profondément impressionnés, la base relevée et rebordée, même autour de l'écusson ; stries dorsales très fines, les latérales plus fortes et densément ponctuées ; interstries densément mais finement granulés, râpeux, le 9e interstrie en arrière fortement granulé rugueux et très convexe. Dent des tibia intermédiaires et postérieurs obtuse.

Long. 4.5–6 mm.

Brésil : prov. de Goyaz, Jatahy, types, une série de spécimens (ex *Donckier*).

Les élytres sont parfois marrons.

Cnemidophorus impressipennis, sp. n.

Oblong, le revêtement jaunâtre sur les élytres dense en avant, épars en arrière, dense sur les flancs du prothorax, sur le dessous dense sur les côtés, les épisternes métathoraciques glabres et lisses.

Rostre droit, peu moins long que le prothorax et sa ponctuation fine et peu serrée (♀) ou plus court, sa ponctuation plus forte, très serrée, en arrière avec une fine carène médiane prolongée jusque entre les yeux (♂). Front très étroit (♂), plus large (♀). Tête convexe, mate, ses points petits, écartés, brièvement sétulosés.

Prothorax noir, transversal, subtronqué à sa base, les côtés assez fortement arqués ; fortement convexe, densément ponctué-rugueux, les rugosités plus ou moins confluentes, plus élevées de chaque côté du milieu derrière la tubulure apicale, mais ne formant pas de gibbosité, avec une étroite carène médiane lisse de la base au milieu où elle s'élargit.

Ecusson élevé et squamulé.

Elytres de moitié plus longs que larges, derrière la base relevée et rebordée avec une impression irrégulière, traversée par la suture convexe, contre cette dernière plus longue, le disque avec deux impressions transversales et dorsales, la 1ère médiane, la 2e postmédiane et plus forte, ces impressions découpant les interstries dorsaux en trois sections ; stries profondes, les dorsales peu visiblement, les latérales distinctement ponctuées ; interstries dorsaux fortement convexes, densément ponctués-râpeux, les interstries latéraux entiers, caréniformes. Tarses ferrugineux.

Long. 7–8 mm.

Brésil : prov. de Goyaz, Jatahy, 2 spécimens, types (ex *Donckier*), ma collection ; deux spécimens, même provenance (British Museum),

FALSOCNEMIDOPHORUS, subgen. nov.

Ce sous-genre n'est représenté que par la seule espèce suivante :

Cnemidophorus (*Falsocnemidophorus*) *crassicollis* Blanch.
in Gay, Hist. Chil. v. 1851, p. 397 (*Læmosaccus*), ♂.

Allongé, subcylindrique, les antennes, les pattes, les élytres roux ; revêtu d'une dense pubescence jaune.

Rostre peu plus long que la moitié du prothorax, presque droit, en dessus légèrement aplani, densément pubescent, la partie apicale glabre, rugueuse, légèrement amincie et déclive (vue de profil), à peine plus longue que large et le tiers de la longueur totale. Front presque aussi large que le rostre.

Prothorax avec sa plus grande largeur en avant, de ce point les côtés en arrière sinués en dedans et les angles postérieurs aigus ; derrière le resserrement antérieur de chaque côté fortement relevé et obtusément tuberculé, dans le milieu graduellement déclive ; ponctuation fine, serrée, peu visible. Ecusson étroit.

Elytres parallèles, deux fois et demie aussi longs que larges, les stries fines, le 5e interstrie à son sommet avec un tubercule fasciculé et noir à son sommet, le 9e interstrie réuni à la suture par une crête transversale pubescente.

Tous les fémurs dentés ; tibias crénelés denticulés en dedans sauf sur leur tiers basal, avec un fort denticule près de l'onglet apical. Hanches antérieures contigues ; saillie mésosternale triangulaire ; deuxième segment ventral aussi long que les 3e et 4e ensemble, les segments brièvement arqués à leurs extrémités ; une légère impression sur le milieu des deux premiers segments.

Long. 6.5 mm.

Chili : Coquimbo, un ♂, type, Muséum de Paris.

APOCNEMIDOPHORUS, gen. nov.

Ce genre diffère des *Cnemidophorus* par la forme des scrobes et celle de la corbeille tarsale postérieure.

Par abréviation la partie du rostre comprise entre sa base et l'insertion antennaire est dite : "partie postérieure."

Le pygidium chez le ♂ est dit "simple" lorsqu'une partie seulement du segment inférieur est découverte, le sillon transversal et le segment supérieur étant recouverts.

Le génotype est : *Apocnemidophorus jacobii*, sp. n.

Tableau des espèces.

1. Elytres avec le 3e interstrie prolongé à son sommet par un fort tubercule recourbé en dehors, le sommet de leur déclivité postérieure avec 6 tubercules fasciculés (sur les interstries 3, 5, 9), le 9e interstrie costiforme en arrière et se réunissant au 3e. Rostre densément ponctué jusqu'au sommet, ♀ cylindrique, ♂ à l'insertion antennaire un peu renflé, plus ou moins coudé, vers le sommet légèrement dilaté et faiblement aminci vu de profil; sillon antéoculaire profond, les antennes insérées vers le tiers basal. Front peu plus étroit que le rostre, impressionné ou fovéolé, les yeux faiblement convexes. Prothorax en avant avec deux forts tubercules séparés par une profonde impression. Elytres assez allongées, s'élargissant en arrière assez fortement dès les épaules. Corbeille tarsale postérieure ascendante, presque de moitié de la longueur du tibia et nettement ciliée. Pygidium petit et peu découvert (♀) ou plus grand, sa partie découverte simple (♂). (APOCNEMIDOPHORUS, n. str.) 2.
- Elytres sans tubercule au sommet du 3e interstrie 3.
2. Deuxième article du funicule aussi long que le 1er. Tubercules dorsaux à pubescence jaune. Prothorax noirâtre avec les côtés sinués en dedans devant les angles postérieurs, derrière les tubercules antérieurs peu convexe. Elytres avec les interstries latéraux plus larges que les points des stries, le 8e sinué derrière le calus huméral. ♂. Rostre avec un 2e sillon étroit, au-dessus du sillon antéoculaire *jacobi*, sp. n.
- Antennes plus courtes, le 2e article du funicule un peu moins long que le 1er. Roux en dessus, les tubercules avec une pubescence blanche. Prothorax avec les côtés indistinctement sinués devant les angles postérieurs, derrière les tubercules antérieurs fortement convexe. Elytres avec les interstries latéraux en avant moins larges que les points des stries, le 8e étroit, costiforme, derrière le calus huméral interrompu par les points des stries. Taille moindre. ♂. Rostre au-dessus du sillon antéoculaire strié ponctué sans sillon supplémentaire. Long. 5.5 mm. *rufescens* Paso. (♂).
3. Antennes insérées vers le milieu ou le tiers basal du rostre, le sillon antéoculaire profond 4.

- Antennes basales, le sillon antéoculaire nul ou très réduit. Prothorax en avant avec deux faibles calus ne modifiant pas sa courbe dorsale (vue de profil). ♂. Rostre non échancré latéralement, le pygidium grand, segmenté. (Subgen. *LIXOCNEMIDOPHORUS*.) 9.
4. Pygidium petit, peu découvert ♀, un peu plus grand, mais sa partie découverte simple ♂. Rostre chez le ♂ un peu renflé vers l'insertion antennaire, derrière celle-ci incisé latéralement, chez la ♀ cylindrique. Elytres et prothorax tuberculés 5.
- Pygidium grand, chez le ♂ segmenté. Yeux convexes, très rapprochés. Massue antennaire fusiforme. Subcylindrique, les élytres sans tubercule ni fascicule. ♂. Rostre non incisé latéralement. Long. 8-9 mm. (Subgen. *LIXOCNEMIDOPHORUS*.) *fusiclava*, sp. n.
5. Antennes insérées vers le tiers postérieur du rostre, chez le ♂ à pubescence normale. Sillon antéoculaire large, profond, atteignant l'œil. Rostre chez la ♀ cylindrique et presque droit, densément ponctué jusqu'au sommet. Prothorax en avant avec deux tubercules, séparés par un profond sillon, son bord antérieur sinué au milieu. Ecuillon étroit, élevé, ponctué. Elytres assez fortement élargies en arrière, avec un tubercule fasciculé sur le sommet du 5e interstrie. Corbeille tarsale postérieure nettement ascendante et ciliée. Tibias antérieurs sinués en dedans. (Subgen. *CHILOCNEMIDOPHORUS*.) 6.
- Antennes insérées vers le milieu du rostre, chez le ♂ plus longues et hérissées de longs poils. Sillon antéoculaire s'affaiblissant en arrière et n'atteignant pas l'œil, le scrobe avec un petit tubercule à la racine des antennes. Rostre courbé, fortement chez le ♂. Prothorax en avant avec deux calus faibles, ne surmontant pas sa courbe dorsale (vue de profil), ses côtés ordinairement tomenteux blanchâtres. Elytres s'élargissant fortement en arrière, les stries fines, ponctuées. Antennes avec le 2e article un peu plus long que le 1er. Brun plus ou moins foncé, les antennes et les tarses ferrugineux. (Subgen. *DICOCNEMIDOPHORUS*.) 7.
6. Prothorax fortement convexe, ses tubercules très élevés, allongés, en arrière dépassant le milieu, leur pubescence serrée et en arrière formant une petite touffe jaune. Elytres s'élargissant fortement en arrière, les stries régulièrement espacées, chaque élytre avec 2, parfois 3 petits

tubercules fasciculés noirâtres disposés en ligne oblique vers le tiers antérieur (sur les interstries 3·5 ou 3·4-5), un tubercule postmédian sur le 3e interstrie, le postérieur du 5e interstrie fort, aigu, fasciculé; interstries impairs plus convexes que les pairs, particulièrement le 3e entre ses deux tubercules. Front avec deux petits tubercules, pubescents, l'impression allongée et au fond avec un fin sillon. D'un rouge lie de vin en dessus, le prothorax plus foncé, les élytres concolores type, ou avec une tache basale noire, parfois envahissant les épaules et se prolongeant sur le bord latéral jusqu'au sommet. Pulvérulence jaune, la pubescence grise ou jaune sur le prothorax, peu visible sur les élytres. Long. 5-7 mm...

obsoletus Blanch.

Var. *craticollis* Blanch. — Taille moindre, ses tubercules plus élevés. Long. 4·5-5 mm.

Prothorax moins convexe, ses deux tubercules moins élevés et moins longs, assez fortement granulés. Elytres s'élargissant peu en arrière, les stries fortement ponctuées, rapprochées par paires, séparées par des interstries inégaux; chaque élytre avec deux petits tubercules fasciculés sur le 3e interstrie, l'un vers le tiers antérieur, l'autre postmédian, le postérieur du 5e médiocre. Front non tuberculé, l'impression ovale, nette, en son milieu avec un point profond. Elytres d'un rouge lie de vin, avec des macules plus foncées ou noirâtres, disposées en trois lignes transversales. Prothorax à pubescence dense, d'un blanc jaunâtre. Long. 5-6·5 mm.

variegatus Blanch.

7. Elytres au sommet du 5e interstrie avec un tubercule fasciculé, suivi d'une impression. Front impressionné. ♂. Rostre pourvu au-dessus de l'insertion antennaire d'une ligne caréniforme

8.

Elytres au sommet du 5e interstrie simplement convexe, sans tubercule ni impression, les 3e et 9e interstries plans et se réunissant en formant un angle aigu. Front plan. ♂. Rostre en arrière longitudinalement impressionné, sans carène au-dessus de l'insertion antennaire. Noir, le revêtement foncé, nébuleux. Long. 5 mm.

nebulosus, sp. n.

8. Elytres avec les interstries pairs plans, les impaires un peu plus larges, mais faiblement convexes. Écusson noir. ♂. Insertion antennaire médiane, le tubercule du rostre en avant du milieu. Brun, les côtés du prothorax tomenteux. Long. 4·5-6 mm.

carnifex Gyll.

- Rouge ferrugineux, même l'écusson, les interstries inégaux, convexes, les impairs beaucoup plus larges et plus convexes que les pairs. ♂. Insertion antennaire légèrement postmédiane, le tubercule du rostre petit, exactement au milieu. Long. 4 mm. *alternatus*, sp. n.
9. Elytres en arrière sans tubercule fasciculé, le 5e interstrie vers son sommet simplement convexe. Tête conique, le front presque aussi large que le rostre 10.
Elytres avec un tubercule fasciculé au sommet du 5e interstrie. Ecusson arrondi et élevé 13.
10. Elytres s'élargissant fortement en arrière, les stries régulières et densément ponctuées, les interstries larges, planes ou peu convexes sans aucune tache fasciculée, la pubescence fine. Insecte marron ou roux, le métasternum et l'abdomen noirs 11.
Elytres peu élargis en arrière, les stries profondes, densément ponctuées, les interstries plus ou moins convexes, le revêtement varié. Prothorax s'élargissant de la base au fort étranglement apical. Rostre presque droit. Antennes courtes, le 1er article du funicule ovoïde et à peine plus long qu'épais. Long. 3.5-4 mm. 12.
11. Prothorax trapézoïdal, sa plus grande largeur à la base, les angles postérieurs aigus, les côtés légèrement comprimés, tomenteux, le bord antérieur sinué au milieu, le disque dans le milieu peu convexe, en avant légèrement déprimé, sans calus. Ecusson étroit, élevé. Elytres avec une courte impression transversale vers le quart antérieur, entre les stries 1-4, précédée d'une légère gibbosité, l'interstrie sutural se rétrécissant d'avant en arrière dans son quart antérieur, l'impression antéapicale petite. Tête et rostre noirâtres, le front fovéolé. Rostre fortement courbé, densément ponctué, chez le ♂ plus épais, légèrement coudé et de chaque côté faiblement et obtusément dilaté vers l'insertion antennaire, la partie basale très rugueuse. Antennes un peu allongées, le 2e article du funicule peu moins long que le 1er, les trois derniers articles globuleux, chez le ♂ plus rubustes. Dessous avec des points serrés, pourvus de poils cendrés plumeux. Long 4-6 mm. *pruinoseus* Blanch.
Prothorax avec sa plus grande largeur près du milieu, les côtés non obliquement comprimés, le bord antérieur non sinué au milieu, les angles postérieurs obtus, le

- disque convexe, en avant avec deux calus peu élevés. Ecusson élevé, mais trapézoïdal. Elytres sans impression transversale en avant. Rostre presque droit.
12. Prothorax avec une carène médiane pointillée, abrégée en avant et vers le milieu dilatée, ses calus antérieurs surmontés d'une fine carène arquée et granulée, l'intervalle des calus large et peu déprimé. Front avec une profonde foveole entourée de pubescence claire.....
- Prothorax dans le milieu fortement convexe et sans carène, l'intervalle des calus étroit et profond. Front avec une profonde impression remontant sur le sommet de la tête, sa largeur les deux tiers de celle du rostre. Deuxième article du funicule moins long que le 1er
13. Elytres avec un seul tubercule fasciculé sur le sommet du 3e ou du 5e interstrie ...
- Elytres avant le sommet avec deux tubercules fasciculés l'un sur le 3e, l'autre sur le 5e interstrie et deux autres presque aussi gros sur le 3e, l'un avant, l'autre après le milieu. Long. 4.5 mm.
14. Tibias antérieurs droits, sauf à la base. Elytres avec le 3e interstrie pourvu de trois fascicules noirs, le 3e un peu plus gros. Long. 3.5 mm.
- Tibias antérieurs fortement courbés, leur angle apical interne avec une touffe de poils jaunes, une tache squamuleuse et avec un (♂) ou deux (♀) denticules. Revêtement blanc ou légèrement teinté de jaune, très dense sur le dessous, sur le prothorax, la base des élytres, le prothorax en arrière avec une tache sombre, subdénudée en forme de T, la tête en dessus glabre, ponctuée, mais au sommet du front avec une tache squamulée ronde blanche. Prothorax en avant avec deux faibles calus triangulaires, ne traversant pas le resserrament apical, séparés par une faible impression, paraissant bilobé. Ecusson glabre, un peu luisant, entouré d'un profond sillon. Elytres peu élargis en arrière, le calus postérieur comprimé, élevé, fasciculé et noir; stries fines, ponctuées, les latérales plus fortes, les interstries subplans, le 3e avec une très faible élévation en avant et une 2e plus longue postmédiane, pubescentes, noires. Deuxième et 5e segments ventraux avec une tache latérale noire, le pygidium densément squamulé. Rostre: ♀, un peu plus de la moitié du prothorax, assez mince, assez arqué, luisant, sa ponctuation fine et espacée; ♂, beaucoup plus épais, sa ponctuation plus forte et plus serrée,
- fulvus*, sp. n.
- subcarinicollis*, sp. n.
- vulgatus*, sp. n.
- 14.
- rubiginosus*, sp. n.
- vilis*, sp. n.

vers l'insertion antennaire gibbeux et fovéolé au milieu, en arrière caréné au milieu. Front le tiers environ de la largeur du rostre. Antennes avec le scape moins long que les trois premiers articles du funicule ensemble, le 2^e article un peu moins long que le 1^{er}. Prothorax avec ses côtés presque parallèles jusqu'au resserrement antérieur, très légèrement sinués en dedans en arrière du milieu; densément et finement ponctué, subgranulé. Elytres s'élargissant modérément en arrière dès les épaules. Long. 4.5-6 mm. 15.

15. Brun marron, type, ou noir, les pattes et les antennes ferrugineuses. Interstries impaires plus larges que les autres

blandus Pasc.

Brun marron, les pattes et les antennes plus claires. Rostre, tête, poitrine et abdomen noirs. Interstries peu inégaux, les stries un peu plus fortes

bicristatus Faust., ♀.

APOONEMIDOPHORUS, gen. nov., s. str.

Apocnemidophorus jacobi, sp. n.

Marron, le ventre noir, la pubescence foncière très fine, peu visible, mais recouvert d'une dense pulvérulence d'un rouge cinabre, ou jaune, les tubercules surmontés d'une pubescence jaune.

Rostre légèrement arqué, un peu moins long que le prothorax (♀) ou plus court, élargi vers l'insertion antennaire, en arrière au dessus du scribe avec un léger sillon et une ligne sinueuse (♂). Tête rugueuse, le front avec un profond sillon. Antennes d'un ferrugineux foncé, le 2^e article du funicule environ deux fois aussi long que large.

Prothorax transversal, ses côtés modérément arqués, profondément sinués en dedans devant les angles postérieurs, ces derniers aigus, les tubercules antérieurs gros, densément granulés et pubescents à leur sommet, en avant leur base traversant l'étranglement apical; le disque densément et finement granulé, avec une étroite carène médiane. Ecusson ovale, élevé, rugueux, pubescent.

Elytres amplement de moitié plus longs que larges, convexes, obliquement déclives latéralement à partir du 5^e interstrie, impressionnés transversalement derrière la base; stries fines, en avant avec de gros points, les

latérales plus profondes; interstries transversalement et densément ruguleux, coriacés, les 4e, 6e, 8e plans et au plus aussi larges que les points des stries, les autres plus larges, les impairs convexes.

Dent des fémurs antérieurs triangulaire, assez aiguë, celle des autres obtuse. Tibias bruns ou roux, densément ponctués, les antérieurs modérément comprimés et droits (à leur base excepté), leur bord interne légèrement bisinué.

Long. 7.5–10 mm.

Paraguay : Alto Parana, Hohenau, type (*H. Jacob*).

Argentine : S. Ignacio (*J. Bosq*), ma collection.

Parana, 1 ♂, coll. Pascoe (British Museum).

Brésil : Sao Paulo (*Preiss*), Muséum de Dresde.

Apocnemidophorus rufescens Pasc. Ann. & Mag. Nat. Hist.
(5) xvii. 1886, p. 419 (♂) (*Læmosaccus*).

Cette espèce voisine de la précédente s'en distingue en plus des caractères indiqués dans le tableau, par sa forme un peu plus étroite et par suite plus allongée, le prothorax plus convexe dans le milieu, sa carène médiane obsolète, les élytres plus convexes dans le milieu.

Parana, type.

Etudié un co-type, ♂, obligeamment communiqué par M. G. Arrow.

CHILOCNEMIDOPHORUS, subgen. nov.

Apocnemidophorus obsoletus Blanch. in Gay, Hist. Chil. v.
1851, p. 397 (*Læmosaccus*).

Var. *crusticollis* Blanch. l. c. p. 397.

Type : de *obsoletus*, Illapel; de *crusticollis*, Conception. Chili, sans localité précise, diverses collections. Concon, Vina de Mar (ma collection).

La variété est bien peu différente du type.

*Apocnemidophorus variegatus** Blanch. l. c. p. 396
(*Læmosaccus*).

Type : Santa Rosa, dans l'Illapel.

Perales (*C. Porter*), ma collection.

Chili, sans localité précise, diverses collections.

DIOCNEMIDOPHORUS, subgen. nov.

Apocnemidophorus carnifex Gyll. in Schönh. Gen. Spec. Curc. iii. 1, 1936, p. 272 (*Magdalis*).

Apocnemidophorus pipitzi Faust, Deutsch. Ent. Zeitschr. xxx, 1886, p. 364 (*Magdalis*).

Apocnemidophorus silbermanni Chev. in Guér. Ic. Règn. Anim. 1844, p. 145 (*Læmosaccus*).

Ovale-oblong, noir de poix ou brun, les antennes et les tarses d'un roux plus ou moins foncé. Prothorax sur les côtés et en dessous tomenteux, blanc, cendré, parfois teinté de jaune, en dessus avec une fine pubescence brune ou noirâtre. Ecusson ovale, élevé, tomenteux, noir. Elytres avec la pubescence foncière grise, ou brune, fine, éparses, sur les élévations plus longue, tomenteuse, noire ou d'un brun foncé, sur le tubercule postérieur jaune ou blanche en avant, noire en arrière.

Rostre brun, à peine moins long que le prothorax, densément ponctué jusqu'au sommet; ♀ cylindrique et modérément arqué; ♂, vers l'insertion antennaire légèrement renflé, coudé, la partie apicale s'amincissant un peu jusqu'au sommet (voir de profil). Antennes médianes, fines; scape atteignant presque le bord postérieur de l'œil; funicule: ♂ avec tous ses articles à cils en dessous longs et hérissés, les deux premiers très longs, le 2^e un peu plus long que le 1^{er}, les suivants notablement plus longs que larges; ♀ les articles moins longs, les 6^e et 7^e seulement aussi longs que larges; massue allongée et acuminée. Front des deux tiers de la largeur du rostre, avec une profonde (♂) ou légère (♀) impression foveolée, prolongée sur la tête en se rétrécissant. Yeux un peu convexes. Tête conique, densément et finement granulée, pubescente ainsi que la base du rostre.

Prothorax peu moins long que large au milieu, les côtés modérément arrondis et les angles postérieurs aigus (♀), ou moins arrondis, distinctement sinués devant les angles postérieurs et ces derniers plus aigus (♂); base assez fortement arquée de chaque côté, le lobe médian faible, obtus; tubulure apicale large, interrompue partiellement par les calus antérieurs; disque pourvu en avant de deux calus granulés, plus élevés chez le ♂, séparés par une dépression en arc, ces calus gros mais peu élevés, vus de profil continuant la courbe dorsale du prothorax, leur bord antérieur à pic sur la tubulure;

disque un peu inégal, très densément ponctué granulé. Ecousson entouré d'un sillon, chez le ♂ moins large que chez la ♀.

Elytres s'élargissant en arrière dès les épaules, de un tiers environ plus longs que larges, largement arrondis, subtronqués au sommet, le calus huméral gros, élevé, granulé; convexes, modérément impressionnés derrière la base, le calus postérieur du 5e interstrie élevé et fasciculé; stries fines, assez régulières, ponctuées; interstries larges, très densément et finement granulés coriacés, plans, la suture à pubescence plus dense soit uniforme, soit formant de petites taches alternées, claires et foncées, les interstries impairs pourvus de 2 à 5 petits fascicules de pubescence noire ou d'un brun foncé, le postmédian du 3e interstrie plus long et plus élevé; au sommet, le 9e interstrie se rétrécissant et se réunissant au 3e, le 10e large. Pygidium vertical, densément ponctué granulé, de chaque côté avec une petite tache de pubescence blanche. Dessous très densément ponctué, les points tapissés de squamules.

Long. 4.5–6 mm.

Brésil: Rio Grande do Sul, types (*Pipitz*).

Brésil: Goyaz, Jatahy, une série de spécimens (ex *Donckier*); Retiro (*Ohau*), Muséum de Dresde. Parana (*Pascoe, Fry*), British Museum.

Argentine: Chaco de Santiago (ex *Le Mout*); Tucuman, Rio Sale (*Girard*); Catamarca; Masao (*Weiser*); Cordoba (*C. Bruch, Lizer*); Sierra de Cordoba; La Granja (*C. Bruch*).

J'ai vu le type de *pipitzi* Faust, un spécimen nommé *carnifex* Gyll. par Chevrolat (Muséum de Stockholm) correspondant à la description et ne différant de *pipitzi* et *silbermanni* que par la coloration plus claire des téguments, caractère ne pouvant être considéré comme spécifique.

Apocnemidophorus alternatus, sp. n., ♂.

Oblong, rouge ferrugineux, les antennes, les tibias et les tarses plus clairs, le prothorax plus foncé, l'abdomen noir, la tête, les côtés et le dessous du prothorax tomenteux, jaunes, la pubescence foncière fine, claire, peu serrée.

Rostre un peu moins long que le prothorax, sa partie basale subplane, rugueuse, devant l'insertion antennaire faiblement et obtusément denté latéralement, obliquement penché en avant, vu de profil son bord inférieur légèrement arqué, le sillon antéoculaire profond, large et à peine aussi long que le diamètre longitudinal de l'œil. Front impressionné, rugueux, sa pubescence en arrière et celle de la tête en avant denses, jaunes et convergentes en un même point. Tête conique, densément ponctuée. Antennes peu longues, leur pubescence couchée, blanche, leurs cils hérissés peu longs, le 2^e article du funicule moins de trois fois aussi long que large, le 7^e globuleux.

Prothorax avec les côtés peu arqués, indistinctement sinués devant les angles postérieurs. Elytres peu élargis en arrière, légèrement impressionnés derrière la base, la pubescence du tubercule postérieur blanche et peu dense; stries profondes et ponctuées, les interstries convexes, inégaux, les impairs beaucoup plus larges que les pairs. Fémurs postérieurs à dent obsolète.

Long. 4 mm.

Argentine: prov. de Tucuman, vi. 1899, un ♂, type, ma collection (C. Bruch).

Cette espèce se distingue du ♂ de *carnifex* et autres ♂ du groupe par sa petite taille, sa coloration, l'insertion des antennes plus près de la base du rostre, les élytres luisants, beaucoup moins élargis en arrière, les interstries convexes et inégaux, les tibias antérieurs distinctement moins larges.

Apocnemidophorus nebulosus, sp. n.

Oblong, noir, mat, les antennes et les tarses bruns ou d'un ferrugineux foncé, le revêtement dorsal fin, fauve et noirâtre, formant quelques taches nébuleuses, les élytres sans calus postérieur, ce dernier remplacé par une tache transversale noire, les fémurs avec une dent aiguë, plus forte aux antérieurs, le prothorax aussi long que large, ses côtés parallèles (♂) ou légèrement dilatés en avant (♀), ses calus faibles, leur intervalle, vu par devant, aussi large que l'un des calus.

Long. 9 mm.

Argentine: Chaco de Santiago, Rio Salado, 2 ♀♀, 1 ♂, types, ma collection.

Brésil: Diamantina, 1 ♂ (E. Gounelle).

Cette espèce est de forme en arrière moins élargie que celle de *carnifex*, particulièrement chez la ♀ ; les élytres sont en ovale plus régulier que chez les deux espèces précédentes.

LIXOCNEMIDOPHORUS, subgen. nov.

Une espèce :

Apocnemidophorus fusiclava, sp. n.

Subcylindrique, les élytres peu élargis en arrière, d'un marron clair, mat, la pubescence dorsale très fine, peu visible sur les élytres, plus dense et d'un rouge cinnabre sur le prothorax, la pulvéulence d'un jaune de soufre, formant sur les élytres trois bandes transversales, l'une subapicale, la 2e submédiane, la 3e basale envahissant la base du prothorax, triangulaire, ne recouvrant pas la région scutellaire, mais se prolongeant sur la suture jusqu'à la bande médiane. Dessous à ponctuation fine, serrée, la pubescence fine, tapissant les points, la pulvéulence irrégulièrement répartie.

Rostre : ♀, un peu moins long que le prothorax, cylindrique, fortement arqué, densément pointillé, plus fortement en arrière, brun foncé, presque mat ; ♂, plus court, plus épais, peu arqué, vers l'insertion antennaire un peu renflé et fovéolé au milieu, en arrière comprimé sur les côtés, en avant déprimé, mat, rugueux. Scrobes courts, fovéiformes, le sillon descendant très court, le sillon antéoculaire profond, semblant continuer le scrobe.

Antennes insérées en arrière du tiers postérieur du rostre, fines, le 1er article à peine plus long que le 2e, le 3e et les suivants transversaux, la massue fusiforme, aussi longue que le funicule, plus foncée. Tête convexe, à ponctuation fine, peu profonde, mais très serrée, les yeux très rapprochés, le front caréné, fovéolé en arrière (♂) ou les yeux moins rapprochés, le front plan, fovéolé (♀).

Prothorax transversal, la partie postérieure pulvinée, plus de deux fois aussi large que longue, les côtés fortement arrondis, la déclivité antérieure verticale, pourvue en son milieu de deux crêtes obliques composées chacune de 4-5 petits tubercules noirs, séparées par une impression peu profonde, tout le disque couvert de granules très petits et très serrés. Ecusson ovale, élevé, au sommet plan, pointillé, pubescent, impressionné en arrière.

Elytres allongés, impressionnés derrière la base, le calus postérieur obsolète, suivi d'une courte et peu profonde impression, les côtés largement sinués en dedans vers le milieu; convexes, les stries densément ponctuées, les dorsales assez fines, les latérales beaucoup plus profondes, les interstries convexes, très densément mais très finement granulés coriacés, les latéraux plus fortement convexes.

Pattes assez élancées; tous les fémurs dentés, la dent des antérieurs plus forte et aiguë. Tibias peu larges, faiblement comprimés, les antérieurs bisinués en dedans. Pygidium ruguleux et pubescent.

Long. 8-9 mm.

Brésil: Bahia, Socodo, 1 ♂, 2 ♀♀, Muséum de Dresde.

LIOCNEMIDOPHORUS, subgen. nov.

*Apocnemidophorus pruinus** Blanch. in Gay, Hist. Chil. v. 1851, p. 396 (*Læmosaccus*).

Apocnemidophorus castaneus Philippi, Stett. Ent. Zeit. 1864, p. 369 (*Læmosaccus*).

Chili: type de *pruinus*, Santa Rosa, Coquimbo; de *castaneus* Phil., Santiago, Vina de Mar; Concon, Chili, sans localité précise, diverses collections.

D'après la description *A. castaneus* (type non vu) n'est autre que *A. pruinus* Bl., aucun caractère ne permettant de les séparer.

Var. *peraffinis*, nov.

Cette variété diffère de la forme typique par sa taille moindre, le rostre un peu moins épais, et pourvu au-dessus de l'insertion antennaire d'un court trait enfoncé, le prothorax plus court, moins long que large à sa base, l'interstrie sutural moins rétréci en arrière.

Argentine: Terr. Rio Negro, Bariloche, xi. 1926, 1 ♀; L. Gutierrez, xi. 1926, 1 ♂ (*F.* et *M. Edwards*), type, British Museum.

Cette variété n'est sans doute qu'une race de la forme chilienne.

Apocnemidophorus fulvus, sp. n. (♀).

Rouge marron, l'abdomen noir, la pubescence jaune et très fine. Rostre aussi long que les deux tiers du prothorax, presque droit, rouge ainsi que la tête. Prothorax

plus long que large à la base, sa plus grande largeur vers le milieu, de ce point les côtés en arrière faiblement arqués convergents, les angles postérieurs obtus (vus de haut), en avant le resserrement antérieur le tiers de la longueur totale, le bord antérieur non sinué au milieu, le disque en arrière convexe, en avant avec une impression médiane large, séparant deux gibbosités assez élevées et granulées, le disque densément et assez finement ponctué.

Elytres derrière la base légèrement impressionnés, les stries à ponctuation serrée, les discales assez profondes, les deux latérales plus larges et plus profondes, les interstries légèrement convexes, finement et très densément transversalement coriacés ruguleux, les 5e, 7e, 8e à leur sommet légèrement gibbeux et densément granulés.

Fémurs antérieurs armés d'une dent triangulaire aiguë, assez forte, les autres fémurs avec une denticule très petit, obsolète. Dessous densément ponctué, le mésosternum rouge.

Long. 5.2 mm.

Argentine : Mendoza, Cunata, 1907, 1 ♀, type, ma collection (J. Bosq).

Apocnemidophorus subcarinicollis, sp. n. (♀).

Brun ferrugineux, les antennes et les tarses plus clairs, la pubescence dorsale fine, flave, la pulvérulence blanche, dense sur les côtés du prothorax, sur les élytres condensée le long de la base et dans l'impression postérieure.

Rostre peu plus long que la moitié du prothorax, épais, sa base chagrinée, mate, en avant luisant, les intervalles des points plus grands que les points. Tête convexe, mate, en avant assez densément ponctué.

Prothorax plus large que long, brusquement et fortement étranglé dans son quart antérieur, le bord antérieur sinué au milieu, les côtés peu arqués mais divergents de la base au tiers antérieur ; fortement convexe, densément ponctué-granulé, en avant au milieu peu déprimé, ses calus très écartés, à égale distance de la carène médiane et du bord latéral. Ecusson arrondi, élevé et ponctué.

Elytres derrière la base et derrière le calus postérieur assez fortement impressionnés, profondément striés ponctué, les interstries convexes, inégaux, les impairs un peu plus élevés que les pairs et quelque peu élargis

dans les parties foncées, tous densément et finement granulés, au sommet le 9e s'épaississant en se réunissant au 3e.

Dents des fémurs antérieurs et intermédiaires aiguës. Dessous avec des points serrés et tomenteux.

Long. 3.5-4 mm.

Argentine : Buenos Aires, 1907, 2 ♀♀ (*C. Bruch*), ma collection.

Les élytres ont deux bandes transversales foncées, plus ou moins distinctes, l'une postmédiane, l'autre plus en arrière.

Apocnemidophorus vulgatus, sp. n. (♂).

Brun foncé, les pattes et les antennes d'un rouge foncé, la pubescence foncière très courte, grise, les élytres avec quelques très petites taches de poils noirs serrés, dont deux plus visibles sur le 3e interstrie.

Rostre très épais, grossièrement rugueux, mat. Tête densément ponctuée et pubescente, l'impression frontale occupant toute la largeur du front, les antennes courtes. Prothorax beaucoup plus large que long, fortement convexe, densément ponctué, la dépression antérieure étroite, profonde, séparant deux calus obsolètes. Ecusson arrondi, densément ponctué, peu élevé.

Elytres courts, les stries fines, ponctuées, les latérales moins larges que les dorsales, les interstries très finement granulés, irrégulièrement et faiblement convexes. Dents des fémurs antérieurs et intermédiaires aiguës. Dessous à points serrés et tomenteux.

Long. 4 mm.

Paraguay : Alto Parana, Hohenau, 1 ♂, ma collection (*H. Jacob*).

Espèce voisine de la précédente, dont elle se distingue par sa forme plus courte, le prothorax plus large, la sculpture élytrale moins forte.

Apocnemidophorus rubiginosus, sp. n. (♀).

Oblong, d'un rouge ferrugineux, le rostre, le méta-sternum et l'abdomen noirs, la pubescence dorsale très courte et très fine, flave.

Rostre de moitié environ du prothorax, peu arqué, sa ponctuation très fine et éparse. Front moitié de la largeur du rostre. Tête obsolètement ponctuée, en avant avec

deux taches de dense pubescence brune, séparées par une petite tache fasciculée et claire. Antennes ferrugineuses, courtes, basales, le scape aussi long que les deux premiers articles ensemble.

Prothorax aussi long que large au milieu, brusquement tubuleux en avant, les côtés parallèles de la base au tiers antérieur, ensuite arqués jusqu'à la tubulure, le bord antérieur non sinué au milieu, les angles postérieurs presque droits et non prolongés; convexe, densément et finement granulé, en avant avec deux faibles gibbosités tomenteuses, brunes, séparées par une impression étroite et peu profonde. Ecusson ovale, concolore, rugueux, convexe.

Elytres s'élargissant un peu en arrière, transversalement impressionnés derrière la base, les stries densément ponctuées, les quatre premières un peu plus fortes que les autres, les interstries peu convexes, le 3e avec trois petits tubercules fasciculés, jaunes, noirs au sommet, le postérieur le plus gros, le 5e interstrie avec un tubercule fasciculé vers son sommet, les interstries impairs plus larges que les pairs, avec quelques petites taches d'un rouge plus foncé, le 3e au sommet réuni au 9e par une ligne caréniforme et pubescente. Tibias antérieurs presque droits, à la base excepté.

Long. 4.5 mm.

Brésil : Entre Rios, 1 ♀, ma collection.

Apocnemidophorus vilis, sp. n. (♀).

Brun de poix, les antennes et les pattes d'un rouge ferrugineux, les élytres entre les quatre premières stries d'un rouge brun.

Rostre de moitié de la longueur du prothorax, modérément arqué, très luisant, sa ponctuation très fine et très épars. Front seulement aussi large que le tiers du rostre, ponctué, mat, ainsi que la tête. Antennes basales courtes, le scape aussi long que les deux premiers articles ensemble.

Prothorax aussi long que large, la tubulure apicale faible, les côtés dans le milieu légèrement arqués, en arrière sinués en dedans, les angles postérieurs aigus et un peu prolongés; convexe, très densément et finement ponctué, en avant obsolètement gibbeux, l'impression médiane très faible.

Elytres peu élargis en arrière, derrière la base faiblement impressionnés transversalement, les stries fines, densément ponctuées, les internes un peu plus fortes, les interstries très densément et très finement granulés coriacés, les impairs plus larges, le 3e avec trois petits tubercules fasciculés, noirs, le postérieur le plus gros, le 5e à son sommet avec un très petit fascicule ; pubescence dorsale peu visible, cependant plus dense et formant un point jaune derrière le calus postérieur.

Tibias antérieurs droits, à la base excepté.

Long. 3.5 mm.

Argentine : Fives Lille, S. Fé, 1 ♀, ma collection (ex Weiser).

Apocnemidophorus blandus Pascoe, Ann. & Mag. Nat. Hist. (5) xvii. 1886, p. 418 (*Læmosaccus*).

Apocnemidophorus niger m., in litt.

Type unique, non vu : Parana.

Brésil : Goyaz, Jatahy, 10 spécimens, ma collection (ex Donckier) ; Minas Geraes : Sete Lagoas (*Ohaus*), Muséum de Dresde ; Sta Catharina, Parana, British Museum.

Paraguay : Ht. Parana, Hohenau (*H. Jacob*), 12 spécimens, ma collection.

Tous ces spécimens sont noirs ou d'un brun noir, les élytres sont revêtus d'une courte pubescence blanche recouverte par une pulvérulence blanche, abondante mais très fugace, de sorte que chez la plupart des spécimens les élytres sont en arrière plus ou moins dénudés et noirs. Un spécimen particulièrement bien conservé, de Hohenau, a été obligeamment comparé au type par M. G. Arrow. Le type, à en juger par la description est un spécimen fraîchement éclôt et dont les téguments n'ont pas atteint leur coloration normale ; il en est de même de la forme suivante, dont j'ai vu le seul type connu et ne différant de *blandus* que par des caractères morphologiques infimes. L'une et l'autre ont les hanches antérieures contiguës et par suite n'appartiennent pas aux *Læmosaccus*, bien que leur faciès rappelle ce dernier genre.

*Apocnemidophorus bicristatus** Faust, Deutsche Ent. Zeitschr. xxx. 1886, p. 365 (*Magdalis*).

Type, ♀ : Rio Grande do Sul.

LÆMOSACCINI.

LÆMOSACCUS Schönh.

Schönh. Curo. Disp. Meth. 1826, p. 50 ; Gen. Spec. Curo. iii. p. 625 ; l. c. viii. 1, 1844, p. 68 (pars) ; Lacord, Gen. Col. vii. p. 13 ; Champ. Biol. Cent.-Amer., Col. iv. 4, 1903, p. 281.

Tête subglobuleuse, plus ou moins saillante, les yeux grands. Rostre : ♀ rarement aussi long que le prothorax, cylindrique, droit ou peu arqué, luisant ; ♂ plus court, aplani en dessus, mat, rugueux ; scrobes médians, rarement basilaires, arqués, descendant sous les yeux. Antennes courtes, le 1er article du funicule plus long que le 2e, la massue forte, rarement un peu moins longue que le funicule ; insérées à l'extrémité du scrobe. Prothorax transversal, brusquement rétréci et tubuleux en avant, sans lobes oculaires, profondément bisinué à sa base, convexe, souvent pulviné. Ecusson grand, au centre d'une petite élévation formé par la suture. Elytres lobés de chaque côté de l'écusson, parallèles ou faiblement élargis en arrière, pas ou à peine plus larges que le prothorax, au sommet subtronqués ou en arc large et laissant le pygidium à découvert, ce dernier grand, en triangle curviligne, chez le ♂ divisé en deux segments, chez la ♀ composé d'un seul segment. Pattes courtes, les antérieures plus longues et plus robustes, leurs fémurs toujours dentés en dessous, leurs tibias comprimés fortement, arqués à la base au moins, rugueux, ainsi que les fémurs, les autres fémurs à dent moindre, manquant parfois aux postérieurs. Tarses médiocres, les articles 1-2 étroits, le 3e large, seul spongieux en dessous, le 4e grêle ainsi que ses ongles.

Corps oblong, subcylindrique, faiblement pubescent.

La pubescence ordinairement peu visible sur les élytres, sauf autour de l'écusson où elle est condensée (collerette scutellaire), plus visible sur le dessous du corps dont elle garnit les points, est composée de très petites squamules profondément incisées presque jusqu'à leur base (squamules pectinées). Chez la plupart des espèces la sculpture elytrale est tout à fait caractéristique du genre ; les interstries se relèvent obliquement de dedans en dehors, leur bord externe est ainsi plus élevé que l'interne, et il est terminé par une carène plus ou moins élevée parfois lisse (interstries latéraux particulièrement), parfois

granulée, râpeuse ou crénelée denticulée, tandis que le reste de l'interstrie est ou alutacé, ou avec de fines hachures transversales serrées, plus rarement granulé; la suture est ordinairement lisse, costiforme ou non.

Le pygidium lorsqu'il est caréné l'est ordinairement chez les deux sexes, rarement chez le ♂ seulement.

Tableau des espèces.

- | | |
|---|----------------------------------|
| 1. Prothorax soit avec des fovéoles, soit avec une impression médiane et longitudinale traversée par une carène médiane | 2. |
| Prothorax sans impressions particulières .. | 10. |
| 2. Elytres noirs ou bruns | 3. |
| Elytres en majeure partie d'un rouge corail, profondément impressionnés vers le milieu, le 3e interstrie dans ses deux tiers antérieurs costiforme, les côtes suivantes interrompues ou réduites par l'impression médiane. Prothorax longitudinalement impressionné et caréné au milieu. Long. 5.7 mm. | 1. <i>albiventris</i> , sp. n. |
| 3. Prothorax fovéolé | 4. |
| Prothorax longitudinalement impressionné en arrière, fortement caréné au milieu. Pygidium caréné. Brun marron, à reflets soyeux sur les élytres, la pubescence sur les côtés du prothorax et autour de l'écusson d'un jaune doré. Long. 7.5 mm. | 2. <i>aureus</i> , sp. n. |
| 4. Prothorax avec seulement deux fovéoles dorsales | 5. |
| Prothorax avec trois fovéoles luisantes au fond, non ponctuées, deux grandes en arrière, ovales, se prolongeant en se rétrécissant jusque sur la base, séparées par un sillon médian large à la base, très étroit, presque interrompu vers le tiers postérieur, s'élargissant en fovéole oblongue dans l'angle supérieur des deux grandes foveoles, se terminant en se rétrécissant au commencement de l'étranglement antérieur; en outre, de chaque côté deux fovéoles irrégulières, assez grandes et lisses; disque grossièrement et irrégulièrement ponctué. Pygidium fortement caréné. Long 6-7.5 mm. ... | 3. <i>canaliculatus</i> , sp. n. |
| 5. Prothorax à ponctuation confluyente en sillons, la carène médiane traversant la tubulure apicale † | 6. |
| Prothorax à ponctuation médiocre, les points serrés, mais non confluentes, la carène médiane nulle ou fortement abrégée en avant, les fovéoles moins profondes et ponctuées | 8. |

† Dans ce cas elle sera dite "entière."

6. Dent des fémurs antérieurs tronquée à son extrémité. Noir, luisant, le prothorax avec sa ponctuation forte, confluyente en sillons, particulièrement sur les côtés en avant, ses deux fovéoles ovales et profondes. Pygidium caréné 7.
- Dent des fémurs antérieurs aiguë. Prothorax ample, peu plus court que large au milieu, grossièrement ponctué rugueux, ses deux fovéoles ovales, sub-basales, profondes, séparées seulement par la carène médiane. Ecusson ovale, convexe, lisse. Elytres modérément impressionnées latéralement vers le milieu, les interstries carénés, le 5e plus élevé, granulé-râpeux sur sa moitié antérieure. Pygidium avec une carène médiane élevée mais courte, n'atteignant par le milieu de sa longueur. Rostre droit, le front profondément fovéolé. Long. 6-5 mm. ... 6. *parcoei*, sp. n. (♀).
7. Antennes et tarses roux. Tubulure apicale du prothorax ponctuée seulement en arrière. Long. 4-5-5 mm. 4. *germari* Bohem.
- Antennes et tarses d'un brun de poix. Tubulure apicale du prothorax ponctuée jusqu'à son bord antérieur. Elytres plus larges et plus courts. Long. 4 mm [cornis, nov., ♂.
5. *germari* var. *fuerci*.
8. Prothorax avec ses fovéoles dorsales beaucoup plus rapprochées du milieu que du bord latéral et situées à une petite distance de la base, la carène médiane nulle ou très courte, antéscutellaire; pourvu, au commencement de la tubulure antérieure, d'une légère fovéole médiane, oblongue, sa ponctuation très serrée, les points arrondis et séparés 9.
- Prothorax avec ses fovéoles subtriangulaires, en dehors profondes et se terminant en forme de virgule incisant la base, en dedans évasées en arrière, en avant leur bord externe presque à égale distance de la carène médiane et du bord latéral, la carène médiane fine, nette, mais fortement abrégée en avant, la ponctuation peu profonde, les points ovales, en avant légèrement confluentes, formant quelques fines rides. Long. 4-5-3 mm. 7. *virgulatus*, sp. n.
9. Pattes noires. Pygidium caréné. Interstries latéraux des élytres carénés. Long. 4-3-4-5 mm. 8. *crucidatus* Bohem.
- Pattes postérieures ferrugineuses ou rousses. Pygidium non caréné. Prothorax à ponctuation visiblement moins forte que chez le précédent. Long. 2-5-4 mm. 9. *ebenus* Pascoe.
10. Antennes basales (♂, ♀). Noir ou brun noir, peu luisant, les antennes rousses .. 11.
- Antennes insérées vers le milieu ou le tiers postérieur du rostre 12.

11. Prothorax avec une carène médiane. Fémurs antérieurs avec leur dent forte, au sommet subobtusé mais non tronquée; tarses foncés. Long. 3.8-4.2 mm. 10. *basalis*, sp. n.
Prothorax peu convexe, le disque aciculé, sans carène médiane. Dent des fémurs antérieurs aiguë, les tarses ferrugineux. Long. 3.2 mm. 11. *aciculaticollis*, sp. n.
12. Elytres soit roux ou ferrugineux, soit avec des taches ou des bandes rouges. Dent des fémurs antérieurs aiguë. Antennes rousses †. 13.
Elytres noirs, tout au plus avec un léger reflet rougoâtre sur la base 18.
13. Prothorax caréné, au moins en arrière. 14.
Pygidium, au moins chez la ♀, et prothorax non carénés 16.
14. Prothorax non aciculé 15.
Prothorax peu convexe, aciculé, caréné en arrière. Rostre à ponctuation serrée. Elytres ferrugineux. Taille grande †. 13. *affaber* Bohem.
15. En entier d'un roux ferrugineux, la pubescence dorsale indistincte. Hanches antérieures assez étroitement séparées. Pygidium relevé le long de son milieu en carène obtuse et ponctuée. Long. 5-5.5 mm. 12. *rufus* Bohem.
Rouge ferrugineux, avec des petites taches de pubescence cendrée sur le prothorax et les élytres. Front très étroit. Long. 3 mm. 14. *pictus*, sp. n.
16. Prothorax pulviné, sa ponctuation profonde. Elytres avec des taches rouges. Pattes postérieures rousses. Long 2-3 mm. 17.
Prothorax modérément convexe, sa ponctuation superficielle. Elytres rouges avec une bande apicale noire. Pattes noires, les tarses ferrugineux. Long. 3-3.5 mm. 15. *semirufus*, sp. n.
17. Elytres avec une bande rouge de sang le long de leur base, recouvrant les épaules et en arrière de ces dernières plus ou moins prolongée, longeant la suture jusqu'au milieu, puis oblique, arquée et se terminant sur le 7e ou le 8e interstrie 16. *pustulatus* Gyll.
Elytres avec une macule basale et une autre obsolète loin en arrière du milieu, d'un rouge ferrugineux. Pygidium ferrugineux au sommet † 17. *quadripustulatus* F.
18. Dent des fémurs antérieurs tronquée à son sommet 19
Cette même dent aiguë 23.

† Voir plus loin *castaneipennis* à élytres marrons, mais avec la dent des fémurs antérieurs tronquée.

† Espèce non vue, placée ici d'après la description.

19. Prothorax sans aire latérale lisse 20.
Prothorax luisant, de chaque côté avec une
aire irrégulière lisse, très luisante, sa
ponctuation irrégulière, sa carène médi-
ane courte. Long. 5-6 mm. 23. *lucens*, sp. n.
20. Prothorax avec une carène médiane 21.
Prothorax pulviné, sans carène médiane,
sa ponctuation superficielle. Dent des
fémurs antérieurs longue. Elytres avec
le 5e interstrie élevé, fortement crénelé
granulé. Long. 3.5-4.5 mm. 18. *brasiliensis*, sp. n.
21. Prothorax pulviné, sa déclivité antérieure
brusque, sa carène médiane forte, entière,
sa ponctuation confluyente 22.
Prothorax avec sa déclivité antérieure
graduelle, oblique, sa carène médiane fine.
Long. 3-3.5 mm. 22. *peruvianus*, sp. n.
22. Pygidium caréné. Prothorax en avant avec
sa ponctuation confluyente en larges mais
peu profonds sillons. Elytres d'un brun
marron à reflets soyeux. Long. 4 mm.
Pygidium non caréné. Dessus mat.
Long. 2.7 mm. 20. [sp. n.]
castaneipennis,
23. Pygidium non caréné, tout au plus avec
une médiane fine, irrégulière formée par la
rencontre des rugosités 21. *pullus*, sp. n.
- Pygidium avec une forte carène médiane et
une fine carène courte ou interrompue
sur le prothorax, ce dernier ample, forte-
ment arrondi sur les côtés. Tibias
antérieurs légèrement dilatés dans leur
moitié apicale interne, à leur sommet
échancrés en dedans contre l'onglet.
Antennes allongées. Long. 4-6 mm. ... 24.
24. Prothorax avec sa déclivité antérieure
oblique dans le milieu 24. *carinipyga*, sp. n., ♀.
- Prothorax pulviné, sa déclivité antérieure
verticale, sa ponctuation grossière, pro-
fonde, dans le milieu confluyente en sillons.
Long. 2-3 mm. 25.
25. Prothorax à carène nulle ou très courte... [Champ.]
Prothorax avec une ponctuation, grossière,
longitudinalement confluyente dans le
milieu, sa carène médiane forte et entière.
Pattes allongées, d'un rouge sanguin.
Long. 4 mm. 26. *sculpturatus*
26. Tête finement ruguleuse sans points dis-
tincts. Prothorax avec sa ponctuation
superficielle, dans le milieu avec de fines
rides. Long. 3.5 mm. 25. *guyanensis*, sp. n.
- Tête avec des points distincts, peu pro-
fonds et assez serrés. Front caréné
brièvement sur les côtés. Antennes
rousses, la massue assemblée. Pro-
thorax brièvement canaliculé au milieu
de sa déclivité antérieure, son bord
antérieur ferrugineux, ses points serrés,
assez profonds, légèrement confluyents
en avant sur le milieu, en arrière avec une
19. *persimilis*, sp. n.

fine et courte carène médiane. Pattes postérieures et intermédiaires, les tibias et les genoux antérieurs d'un rouge ferrugineux. Long. 2-75 mm. 27. *frontalis* Kirsch.

Description des espèces.

1. *Læmosaccus albiventris*, sp. n. (Chevr., in litt.).

Tête, rostre, dessous noirs, ce dernier recouvert d'une couche de squamules soyeuses blanches, les élytres rouges, leurs côtes latérales (extrémités excepté), la 3e à son extrémité, la 5e au commencement de sa partie postérieure, noires, le prothorax d'un rouge plus foncé. Pubescence dorsale très fine, éparsse, jaune.

Rostre assez densément pointillé, peu arqué, luisant (♀) ou plus court, rugueusement ponctué, mat (♂). Front peu plus du tiers de la largeur du rostre, déprimé, avec un petit point enfoncé. Antennes rouges, médianes, le 1er article plus long que les deux suivants ensemble.

Prothorax un peu plus large que long, ses côtés assez fortement arqués; convexe, avec une large et assez profonde impression médiane, rétrécie en avant, traversée par une carène forte, moins élevée, subinterrompue vers le tiers antérieur; la ponctuation très fine et très serrée; sur la base une lunule de dense pubescence d'un brun noir veloutée, coupée par la carène. Ecusson flanqué de deux taches oblongues, de pubescence veloutée, d'un brun noir, au sommet claire, l'écusson élevé, luisant.

Elytres subrectangulaires, de chaque côté vers le milieu avec une profonde impression, interrompant les côtes; interstries faiblement sculptés, le 3e fortement relevé jusqu'au tiers postérieur, en côte obtuse, légèrement ondulée, à son extrémité plus épaisse, plus élevée et plus fortement granulée, le 5e interstrie dans sa moitié basale en côte vive, fortement sinueuse, dans sa partie postérieure très élargie, très élevée, obtuse et densément granulée, les côtes latérales vives, caréniformes et sinueuses. Pygidium finement ponctué, pubescent, la pubescence jaune, très serrée sur la carène médiane.

Pattes rouges, les tarses plus clairs, les tibias antérieurs noirâtres, la dent des fémurs antérieurs assez forte et aiguë.

Long. 5-7 mm.

Colombie, type ♀, collection *Sharp* (British Museum); Muséum de Stockholm, de Halles a. S. (coll. *Germar*).

Vénézuëla: Caracas, (collections *Pascoe*, *Fry*), 10 ♀♀, 1 ♂.

La pubescence du dessous est parfois d'un blanc teinté de jaune crème; elle est très dense sur les flancs du prothorax. La tâche basale du prothorax et celles de l'écusson sont souvent frottées. Les taches noires des élytres sont variables de nombre et de dimension. Le 3e interstrie émet souvent, en dehors, à extrémité de sa côte, un petit rameau transversal oblique.

Malgré ces différentes variations l'espèce est très distincte.

2. *Læmosaccus aureus*, sp. n.

♀. Brun marron, à reflets soyeux, particulièrement sur les élytres, les antennes et les pattes d'un rouge ferrugineux, les côtés du prothorax, la collerette scutellaire, le pygidium revêtus d'une dense pubescence d'un jaune d'or.

Rostre aussi long que le prothorax, peu arqué, assez densément ponctué, en arrière avec une ligne médiane lisse. Front étroit, sillonné. Tête mate, finement pointillée. Prothorax avec ses côtés subparallèles jusqu'au milieu; modérément convexe, criblé de gros points irréguliers, confluent en sillons, obliquement transversaux; avec une impression basale grande, ovale profonde en arrière, moins profonde et rétrécie en avant, traversée par une forte carène entière traversant la tubulure apicale. Ecusson grand, en demi-ovale, élevé, en avant profondément impressionné, lobé.

Elytres profondément impressionnés latéralement vers le milieu des côtés, les stries très étroites, la suture et le 2e interstrie plans et lisses, le 5e interstrie plus large et plus élevé que les autres, en côte à son sommet arrondie et sur toute sa longueur fortement ponctué granulé, le 3e dans sa moitié antérieure plus large, ponctué granulé, les 6e et 7e vers leur sommet ponctués granulés, les autres interstries costiformes et lisses. Métasternum à ponctuation fine, mais serrée. Pygidium avec une carène médiane forte à la base, s'affaiblissant au sommet. Dent des fémurs antérieurs aiguë.

♂. Rostre plus court, droit, mat, au sommet densément pointillé, en arrière ruguleux, avec trois lignes dorsales,

vers la base la médiane effacée, les latérales convergentes, entre l'insertion des antennes fovéolé. Dent des fémurs antérieurs large, mais obtuse. Tibias antérieurs dilatés en avant en dedans. Carène du pygidium moins forte.

Long. 7.5 mm.

Paraguay : Ht. Parana, Hohenau (*H. Jacob*), 1 ♀, type, ma collection. Brésil : Bahia, Socoda, 1 ♂, Muséum de Dresde.

3. *Læmosaccus canaliculatus*, sp. n. (♀).

Noir, luisant, les tarses roux, les antennes ferrugineuses, la massue plus longue que le funicule, cendrée. Rostre aussi long que le prothorax, peu arqué, luisant, en dessus avec un pointillé épars, en arrière sur les côtés densément ponctué. Front très étroit et sillonné. Tête convexe, éparsément et très finement pointillée. Prothorax pulviné, sa tubulure apicale éparsément pointillée, sa partie dorsale pourvue de trois fovéoles et de 4 impressions, entre les impressions densément et irrégulièrement ponctué, râpeux. Ecusson grand, arrondi, lisse.

Elytres transversalement impressionnés latéralement vers le milieu, séparément arrondis au sommet, la suture et le 2e interstries en partie lisses, le 3e interstrie en avant, le 5e sur toute sa longueur transversalement, ciselés granulés râpeux, les autres interstries irréguliers, carénés dans l'impression latérale, les latéraux plus nettement carénés. Fémurs à pubescence jaune, la dent des antérieurs aiguë. Pygidium à ponctuation râpeuse, avec une forte carène médiane. Méta sternum ponctué.

Long. 6-7.5 mm.

Paraguay : Ht. Parana, Hohenau, 1 ♀, type, ma collection (*H. Jacob*). Brésil : Goyaz, Jatahy, 1 ♀ (British Museum).

4. *Læmosaccus germari** Bohem. in Schönh. Gen. Spec. Curo. viii. 1, 1844, p. 70 (♀).

Noir d'ébène, très luisant, en dessus glabre, les pattes avec des poils très courts, les points du dessous pourvus de squamules pectinées, blanches.

Rostre : ♀, cylindrique, les 2/3 de la longueur du prothorax, droit, luisant, la ponctuation en avant très fine et épars, en arrière dense sur les côtés et avec une ligne

médiane lisse et un peu relevée; ♂ plus court, rugueux, alutacé entre les points. Front de moitié de la largeur du rostre, profondément impressionné, fovéolé au milieu, mat. Tête alutacée, mate. Antennes médianes, ferrugineuses, la massue ovale, aussi longue que le funicule (♀) ou plus allongée et plus longue (♂).

Prothorax ample, deux fois aussi large que long (tubulure apicale non comprise), les côtés fortement arqués, la base fortement bisinuée et son lobe médian fort; gibbeux, criblé de gros points oblongs, lisses, plus ou moins confluent longitudinalement en sillons, particulièrement sur les côtés en avant, le long de la base moins gros et peu confluent, la tubulure apicale ponctuée le long de sa base; fovéoles dorsales grandes, faiblement ovales, profondes, leur fond avec quelques grands points superficiels, étroitement séparées par la forte carène médiane entière. Ecusson grand, arrondi, un peu élevé.

Elytres vers le milieu latéralement impressionnés jusqu'au 5e interstrie, très luisants, à peine sculptés, les sillons étroits et indistinctement ponctués, les épaules et le 5e interstrie fortement granulés râpeux, la suture en avant, les interstries 2-3-4 élevés, caréniformes, le 5e le plus large et le plus élevé, les 7e et 8e brièvement carénés dans l'impression.

Pattes noires, les tarses roux; fémurs antérieurs armés d'une dent large, sa troncature apicale perpendiculaire à son axe. Points du dessous peu serrés. Pygidium avec une forte carène.

Long. 4-5.5 mm.; type 4.5 mm.

Brésil, type, collection Germar; Rio de Janeiro (ma collection). Argentine: Gob. Misiones, 1922, no. 230 (*C. Bruch*!). Paraguay: Ht. Parana, Hohenau (*H. Jacob*).

La collection Germar renferme 5 spécimens, tous ♀, le type a les fémurs postérieurs avec un vague reflet rougeâtre, et noirs chez les autres spécimens.

5. Var. *fuscicornis*, sp. n., ♂.

Cette variété diffère de la forme typique, en outre des caractères indiqués dans le tableau, par le prothorax un peu moins large et plus convexe, les élytres avec leurs interstries latéraux plus distinctement carénés sur toute leur longueur.

Long. 4 mm.

Brésil : Goyaz, Jatahy, 1 ♂, type, ma collection (ex *Donckier*) ; 1 ♂, même provenance (British Museum).

Le pygidium n'est pas caréné chez le type, faiblement caréné chez l'autre spécimen.

6. *Læmosaccus pascoei*, sp. n., ♀.

Noir, les côtés du prothorax revêtus d'une dense pubescence flave, pectinée.

Rostre presque droit, à peine moins long que le prothorax, pointillé. Front de un tiers de la largeur du rostre, avec un court sillon, impressionné, l'impression se prolongeant en s'élargissant sur le sommet de la tête, cette dernière avec des petits points épars, leurs intervalles alutacés. Antennes médianes, ferrugineuses.

Prothorax peu plus large que long, sa plus grande largeur vers le quart basal, les côtés modérément arrondis ; convexe, déprimé au milieu en avant contre la carène médiane, les deux fovéoles grandes, au fond avec quelques grands points superficiels, la ponctuation dorsale profonde, très serrée, très peu confluyente le long de la base et sur les côtés, dans le milieu en avant confluyente en rugosités assez fortes, la carène médiane vive et entière, l'étranglement antérieur éparsément et superficiellement ponctué, marginé de ferrugineux.

Elytres avec les épaules, les interstries 3 jusqu'au milieu, 5 presque jusqu'au sommet fortement sculptés, le lobe basal formé par les interstries 2-3-4, convexe, lisse, en avant en angle obtus ; interstries lisses, leur carène latérale non ou très finement granuleuse ; impression latérale courte. Tarses roux.

Long. 6.5 mm.

Brésil, sans localité précise, collection Pascoe (British Museum).

7. *Læmosaccus virgulatus*, sp. n., ♀.

Noir, luisant, les antennes et les tarses roux, la pubescence sur le dessus indistincte, sur le dessous blanche et tapissant les points, peu serrée et pectinée.

Rostre de moitié aussi long que le prothorax, droit, assez densément ponctué. Front un tiers de la largeur du rostre, fovéolé au sommet. Tête assez densément ponctué et mate. Antennes médianes, le 1er article

du funicule deux fois aussi long que large, le 2e conique, aussi long que large, les suivants fortement transversaux, très serrés et graduellement élargis.

Prothorax (étranglement antérieur exclu) plus du double aussi large que long, les côtés peu arqués, la base faiblement bisinuée de chaque côté; gibbeux, la ponctuation serrée, sur l'étranglement antérieur les points épars, superficiels. Ecusson arrondi, lisse, en avant impressionné.

Elytres courts, de un tiers environ plus longs que larges, sur les côtés légèrement sinués, non impressionnés; profondément striés ponctués, les interstries relevés obliquement et carénés, le 5e plus élevé et fortement granulé râpeux, les trois premières côtes faiblement sculptées, les latérales lisses. Pygidium à ponctuation grande, mais superficielle, ruguleux. Dent des fémurs antérieurs longue et tronquée à son sommet.

Long. 4-5.3 mm.

Brésil, sans localité précise, 1 ♀ (*Bowring*), British Museum.

Elle portait le nom de *chevrolati* Guér., mais ne répond nullement à la description de cette dernière espèce.

Rio Janeiro, 1 ♀ (*Alexander Fry*), British Museum.

8. *Læmosaccus trucidatus* Germ. Ins. Spec. Nov. 1824, p. 196 (♀); Bohem. in Schönh. Gen. Spec. Curc. viii. 1, 1844, p. 69.

Le type est une femelle de 4.5 mm. de longueur.

Brésil, sans localité précise, type. Matto Grosso, Corumba, 1 ♀, ma collection (ex *Staudinger*); Rio de Janeiro (*Fry*, British Museum), 1 ♀. Le ♂ reste inconnu.

L'espèce est très voisine de la suivante, mais de taille et de sculpture plus fortes.

9. *Læmosaccus ebenus* Pasc. Ann. & Mag. Nat. Hist. (5) xvii. 1886, p. 419.

Champ. Biol. Centr.-Amer., Col. iv. 4, 1903, pp. 282, 287.

Oblong, terne, noir, le bord antérieur du prothorax, les antennes, les pattes intermédiaires et postérieures, les genoux et les tarses antérieurs plus ou moins ferrugineux; en dessous éparsément revêtu de squamules blanches et pectinées.

Tête mate, alutacée, éparsément pointillée, les yeux grands et bien séparés.

Rostre : ♂ court et robuste, rugueusement ponctué, mat jusqu'au sommet ; ♀ plus long, cylindrique, luisant et assez éparsément ponctué. Antennes avec la massue ovale oblongue, robuste, un peu plus longue que le funicule.

Prothorax à peu près aussi large que les élytres, transversalement convexe, fortement resserré et rétréci en avant, modérément arqué sur les côtés ; criblé de points serrés, assez grands mais peu profonds, les fovéoles faibles, la carène médiane nulle ou obsolète. Ecusson ovale-oblong, subplan, avec quelques points, mat.

Elytres largement lobés à la base, profondément striés ponctuels, les interstries alutacés, extérieurement relevés et granulés râpeux. Pygidium ponctué rugueux.

Fémurs antérieurs avec une dent courte mais aiguë, les autres fémurs faiblement dentés.

Long. 2.5-4 mm.

Brésil : Santa Catarina, type ; prov. de Goyas, Jatahy (ex *Donckier*). Panama.

10. *Læmosaccus basalis*, sp. n.

Brun noir ou brun rouge, terne, les antennes ferrugineuses, la collerette scutellaire blanche, les points du dessous tapissés de squamules blanches, pectinées, par place plus serrées.

Rostre : ♀, peu plus du double aussi long que large, gros, droit, lisse, éparsément pointillé ; ♂ mat, plus court, plus épais, en arrière avec un profond sillon médian prolongé jusqu'au sommet du front, limité de chaque côté par une carène obtuse contournant l'œil. Front large, la tête densément ponctuelle, les yeux convexes. Antennes avec le scape dépassant notablement le bord antérieur de l'œil, le 1er article ovoïde, assez long, le 2e aussi long mais beaucoup moins épais que le 1er.

Prothorax peu plus large que long, ses côtés fortement arqués ; pulviné, sa déclivité antérieure brusque ; criblé de points oblongs, superficiels, très serrés, sur la partie centrale du disque aciculés, confluent en fines rides allongées, anastomosés, sur les côtés mieux séparés, la carène médiane fine et entière, l'étranglement antérieur coriacé, son bord apical ferrugineux. Ecusson ovale, impressionné.

Elytres un peu plus longs que larges, obsolètement impressionnés latéralement, derrière la base faiblement impressionnés ; convexes, profondément striés ponctués, les interstries larges, alutacés, peu relevés latéralement, leur bord externe densément mais finement crénelé râpeux. Pygidium ponctué rugueux.

Fémurs antérieurs avec une assez forte dent peu aiguë, leur bord inférieur crénelé, la dent des autres fémurs petite ; tibias antérieurs fortement comprimés, arqués, dans leur moitié apicale interne un peu dilatés, plus fortement chez le ♂ ; tarses bruns.

Long. 3.8-4.2 mm.

Brésil : Goyaz, Jatahy, type, ma collection (ex *Donckier*) ; Diamantina (*Gounelle*).

11. *Læmosaccus aciculaticollis*, sp. n., ♀.

Rostre lisse, luisant, très droit. Prothorax moyennement convexe, dans le milieu en avant avec sa déclivité antérieure très oblique, atteignant l'étranglement antérieur en formant un angle très obtus et peu marqué, les côtés plus convexes latéralement, le disque couvert de fines lignes presque parallèles, le milieu en arrière avec une simple ligne droite, indistinctement plus épaisse que les autres. Collerette supportant l'écusson élevée et tomenteuse.

Elytres légèrement comprimés latéralement, le 3e interstrie en avant, le 5e en arrière distinctement plus élevés et plus fortement sculptés que les autres. Tibias antérieurs peu arqués et non dilatés en avant. Tarses d'un roux clair. Les autres caractères analogues à ceux de l'espèce précédente.

Long. 3.2 mm.

Brésil : Goyaz, Jatahy, 1 ♀ (ex *Donckier*), ma collection.

Cette espèce se distingue encore de la précédente par sa forme plus étroite, par son prothorax un peu plus long, moins arqué sur les côtés et surtout beaucoup moins convexe, sa déclivité antérieure graduelle, sa sculpture plus fine ; les tibias antérieurs sont moins larges, moins arqués et non dilatés.

12. *Læmosaccus rufus** Boh. in Schönh. Gen. Spec. Curc. viii. 1, 1844, p. 72 (♀).

Oblong, d'un roux ferrugineux ; points du dessous tapissés de squamules cendrées.

Rostre aussi long que le prothorax, modérément arqué, grêle, éparsément pointillé, au sommet un peu rembruni. Front avec une petite fovéole. Antennes médianes, le 1er article allongé, aussi long que les trois suivants ensemble, ces derniers courts.

Prothorax à peine plus court que large au milieu, tronqué au sommet, les côtés modérément arqués; convexe, à ponctuation fine, très serrée mais non confluyente, avec une fine carène médiane. Ecusson arrondi, lisse.

Elytres quadrangulaires-oblongs, non élargis en arrière; convexes, transversalement impressionnés derrière la base, les stries profondes, au fond obsolètement ponctuées, les interstries dorsaux convexes, densément et finement granulés, les 3e et 5e un peu plus larges et un peu plus élevés, les latéraux étroits, carénés et lisses. Pygidium densément ponctué rugueux. Tous le fémurs dentés, les dents aiguës; tibias antérieurs droits, à la base excepté.

Hanches antérieures avec leur écartement moitié de celui des intermédiaires.

Long. 5-5.5 mm.

Type: Brésil? (*Ménétrières*). Rio de Janeiro (*Fry*); Brésil (coll. *Bowring, Sharp*), 4 spécimens, ♀.

Le type n'a aucune trace de carène sur le pygidium, les spécimens du British Museum, en ont une à peine perceptible.

13. *Læmosaccus affaber* Boh. l. c. p. 68.

Ovale, noirâtre, terne, revêtu de squamules très éparses, jaunes de sable.

Tête convexe, criblée de très petits points, d'un brun de poix, squamulée au-dessus des yeux, le front légèrement fovéolé. Rostre de la longueur du prothorax, assez grêle, cylindrique, presque droit, criblé de très petits points. Antennes ferrugineuses, la massue revêtue d'une dense pubescence cendrée.

Prothorax moins long que large en arrière, tronqué au sommet, rétréci en avant, les côtés fortement arqués, peu convexe, le disque densément et très finement aciculé, la base, les côtés, le sommet densément pointillés; noir, mat, les squamules éparses. Ecusson médiocre, arrondi, noir de poix, sublisse.

Elytres en avant modérément et séparément lobés, peu plus larges à la base que le prothorax, en arrière non

élargis ; peu convexes, légèrement impressionnés transversalement derrière la base, les stries profondes, leurs points allongés, les interstries étroits, carénés, densément granulés ; d'un ferrugineux foncé, peu luisants, glabres. Pygidium densément ponctué, caréné au milieu.

Dessous assez densément mais très finement ponctué, noir de poix, les côtés du sternum et de l'abdomen squamulés. Pattes noires, les tarses d'un roux ferrugineux, tous les fémurs armés d'une dent aiguë, tibias légèrement arqués, comprimés.

La plus grande espèce du genre, de la taille de *Alcides hæmopterus*. Amérique méridionale, type Muséo de St. Pétersbourg.

Espèce non vue, placée d'après la description.

14. *Læmosaccus pictus*, sp. n., ♀.

D'un rouge ferrugineux, le prothorax plus foncé, la tête noirâtre, en dessus orné de petites taches blanches composées de petites squamules, brièvement pectinées, en dessous revêtu de squamules cendrées, serrées, excepté sur le milieu de l'abdomen.

Rostre des deux tiers de la longueur du prothorax, un peu arqué, luisant, assez densément ponctué. Front très étroit, dans sa partie supérieure fovéolé et de chaque côté avec une petite tache de squamules jaunes. Tête mate, densément ponctué. Antennes ferrugineuses, médianes, courtes, la massue grosse, plus longue que le funicule.

Prothorax avec sa partie postérieure plus de deux fois aussi large que longue, assez fortement arrondie sur les côtés, modérément convexe, criblée de points serrés, la carène médiane subinterrompue en avant, la tubulure apicale ferrugineuse, obsolètement ponctué ; avec quatre taches peu tranchées, transversalement disposées vers le milieu, le reste avec une pubescence jaunâtre. Ecusson arrondi, élevé, lisse, sa collerette jaune, sa pubescence dense.

Elytres faiblement lobés à leur base, faiblement élargis en arrière, non impressionnés latéralement ; convexes, les stries étroites, profondes, obsolètement ponctué ; interstries égaux, les dorsaux en avant presque plans, ponctué, squamulés, en arrière lisses, luisants, latéralement carénés, le calus postérieur gros, élevé, les interstries latéraux plus distinctement carénés ; mats, sauf en arrière, les taches blanches plus nombreuses en avant du calus

postérieur et sur le tiers antérieur. Pygidium à pubescence jaune, sur son milieu très dense et formant une crête. Dent des fémurs antérieurs aiguë.

Long. 3 mm.

Brésil : Parana, 1 ♀ (Fry), British Museum.

15. *Læmosaccus semirufus*, sp. n.

Noir, mat, les élytres d'un rouge brique, excepté une bande apicale noire, les antennes et les tarses ferrugineux.

Rostre : ♀ droit, gros, moitié de la longueur du prothorax, en avant lisse, luisant, en arrière éparsément ponctué ; ♂, mat, densément ponctué jusqu'au sommet, peu déprimé en dessus, deux fois aussi long que large. Antennes postmédianes, le scape atteignant l'œil, le 1er article obconique et plus de deux fois aussi long que large. Front étroit, le tiers de la largeur du rostre, mat, obsolement ponctué, avec un point enfoncé.

Prothorax peu plus large que long, assez fortement arqué sur les côtés, fortement convexe, mais sa déclivité antérieure dans le milieu presque graduelle, très oblique, la tubulure apicale peu forte ; couvert d'un réseau de mailles délimitant des points superficiels, oblongs, parfois avec des traces d'une carène linéiforme. Ecusson sillonné au milieu, sa collerette à pubescence jaune.

Elytres courts, peu plus longs que larges, faiblement élargis en arrière, lobés à la base, les calus huméraux et apicaux faibles ; profondément sillonnés, les points des sillons espacés ; tous les interstries de même hauteur, finement carénés et avec de fins granules espacés. Pygidium finement et densément ponctué.

Tous les fémurs avec une dent aiguë, celle des antérieurs plus forte.

Long. 3-3.5 mm.

Brésil : Goyaz, Jatahy, 3 ♀, 1 ♂, ma collection (ex Donckier).

Espèce de forme courte.

16. *Læmosaccus pustulatus* Gyll. in Schönh. Gen. et Spec. Curc. iii. 2, 1836, p. 626.

Noir, mat, en dessous revêtu de squamules blanches peu serrées, les antennes et les pattes d'un roux obscur.

Rostre : ♀ moitié de la longueur du prothorax, droit, éparsément ponctué luisant ; ♂ plus gros, plus court, rugueux et mat. Front moitié aussi large que le rostre,

ainsi que la tête éparsément ponctués et mats. Antennes médianes, le scape atteignant l'œil, le 1er article plus long que les 2e et 3e ensemble, les suivants courts, serrés, le 7e plus gros contiguë à la massue.

Prothorax à peine plus large que long, pulviné, les côtés fortement arqués, sa déclivité antérieure peu brusque, le bord antérieur ferrugineux, criblé de points profonds, très serrés, en avant confluent en sillons, sa carène linéiforme. Ecusson ovale, plan, étroitement impressionné.

Elytres sillonnés, les sillons avec des points peu serrés, les interstries sensiblement de même élévation, costiformes, avec des séries de petits granules, plus distincts en avant, plus élevés chez le ♂ ; noirs, luisants, chacun avec une bande rouge le long de la base, recouvrant les épaules et en arrière de ces dernières plus ou moins prolongée, longeant la suture jusqu'au milieu, puis oblique, arquée et se terminant sur le 7e ou le 8e interstrie. Pygidium rugueusement ponctué, caréné dans sa partie supérieure chez le ♂. Pattes intermédiaires et postérieures, les tarses antérieurs rouges. Dent des fémurs antérieurs petite et aiguë. Métasternum assez densément ponctué et squamulé.

Long. 2.1-2.9 mm.

Brésil : type (coll. Falderman), non vu, Matto Grosso, Corumba (ex *Staudinger*). Rio de Janeiro (*Fry*), S. Paulo, Campinas (*id.*), British Museum.

La carène du prothorax est très fine, parfois obsolète. Chez les spécimens vus le pygidium est unicolore noir (indiqué roux au sommet par *Gyllenhal*, et par exception caréné seulement chez le ♂.

17. *Læmosaccus quadripustulatus* F., Boh. in *Schönh. Gen. Spec. Curc.* viii. 1, 1844, p. 73.

Noirâtre, submat, les antennes et les pattes d'un roux ferrugineux. Prothorax pulviné, criblé de points profonds, en avant ferrugineux.

Elytres sillonnés, les interstries étroites, costiformes, ornés d'une tache transversale basale et d'une macule avant le sommet d'un roux ferrugineux obsolète. Fémurs pourvus d'une petite dent aiguë.

Brésil, Muséum de Copenhague.

Petite espèce, deux fois plus petite que *L. plagiatus*, non vue.

18. *Læmosaccus brasiliensis*, sp. n.

Noir, peu luisant, les antennes d'un ferrugineux foncé.

Rostre : ♀ gros, peu arqué, des deux tiers de la longueur du prothorax, s'élargissant un peu en avant, luisant, sa ponctuation assez forte, peu serrée ; ♂ plus court, mat, fortement rugueux. Front moitié de la largeur du rostre alutacé, mat, déprimé et avec un sillon médian un peu prolongé sur la tête, cette dernière alutacée, mate, avec quelques points épars. Antennes médianes, le scape n'atteignant pas l'œil, le 1er article allongé, plus long que les 2e et 3e ensemble, le 2e court.

Prothorax peu plus large que long, les côtés modérément arqués ; pulviné, sa déclivité antérieure brusque, sub-verticale ; couvert d'un réseau de mailles assez régulières, délimitant des points oblongs, peu profonds, très serrés, la tubulure apicale ponctuée, son bord antérieur ferrugineux. Ecusson grand, subrectangulaire, arrondi en arrière, plan, lisse, en avant au milieu plus ou moins impressionné, sa collerette cendrée.

Elytres peu plus longs que larges, faiblement élargis en arrière, les lobes de la base forts et anguleux, le calus huméral peu élevé et granulé râpeux, le calus postérieur et l'impression suturale faibles ; profondément sillonnés ponctués, la suture en avant costiforme, les interstries obliquement relevés, carénés latéralement, les carènes ponctuées granulées, la 5e plus élevée, fortement crénelée, granulée, râpeuse. Pygidium densément ponctué.

Tous les fémurs dentés, la dent des antérieurs longue et tronquée. Fémurs antérieurs en dessous granulés râpeux. Tarses d'un brun de poix, parfois roux. Métastrernum très densément ponctué, les points avec des squamules blanches. Saillie intercoxale du mésosternum rectangulaire, deux fois aussi large que longue.

Long. 3.5-4.5 mm.

Brésil : Goyaz, Jatahy, une série de spécimens, type dans ma collection (ex *Donckier*).

19. *Læmosaccus persimilis*, sp. n., ♀.

Espèce très semblable à la précédente, dont elle se distingue nettement par la dent aiguë des fémurs antérieurs, la déclivité antérieure très oblique du prothorax.

Rostre moitié seulement du prothorax, lisse, luisant, les points peu serrés même à la base. Front étroit,

moindre que la moitié du rostre, plan, ponctué. Tête mate, à ponctuation indistincte. Prothorax avec ses points encore plus superficiels et plus petits, dans le milieu avec quelques fines lignes presque droites, le réseau de mailles par suite moins régulier. Interstries des élytres plus élevés, particulièrement le 3e.

Long. 3.5 mm.

Brésil : Diamantina, 3 ♀♀, ma collection (ex Gounelle).

20. *Laemosaccus castaneipennis*, sp. n., ♀.

Noir, les élytres d'un brun marron à reflets soyeux, luisants, les lobes de leur base d'un rouge ferrugineux, ainsi que la tubulure apicale du prothorax, les pattes d'un rouge sanguin, les pattes antérieures plus foncées.

Rostre droit, court, à peine plus long que la moitié du prothorax, luisant, sa ponctuation moins serrée sur la ligne médiane que sur les côtés. Front large, les deux tiers de la largeur du rostre, impressionné, finement alutacé, mat, finement sillonné au milieu en arrière. Tête finement alutacée et mate. Antennes ferrugineuses, légèrement postmédianes, les deux premiers articles allongés, le 1er peu plus long que le 2e.

Prothorax pulviné, sa plus grande largeur près du milieu, les côtés faiblement arqués, convergents en arrière du milieu, la déclivité antérieure brusque, la base devant le lobe élytral avec une aire obliquement relevée, contre la carène médiane, de chaque côté, avec une aire transversale formée de sillons beaucoup plus larges et un peu plus profonds que les sillons dorsaux, la tubulure apicale subliasse. Ecusson ovale, plan, lisse, grand.

Elytres convexes, la dépression apicale de la suture assez forte, le calus huméral peu élevé, rugueux, les lobes de la base moyens, arrondis ; interstries luisants, microscopiquement alutacés, relevés, au sommet finement granulés râpeux, lisses en arrière, le 5e plus élevé, râpeux sur toute sa longueur. Pygidium alutacé, ses points grands, superficiels, sa carène vive et entière.

Fémurs antérieurs alutacés entre les rugosités, leur dent ferrugineuse tronquée, celle des autres fémurs aiguë. Ponctuation du métasternum assez forte et serrée.

Long. 4 mm.

Brésil : Bahia, 1 ♂ (Reed, coll. Fry), British Museum.

21. *Læmosaccus pullus*, sp. n., ♀ (Jekel, in litt.).

Noir, terne, les antennes, les pattes intermédiaires et postérieures, les tarses antérieurs d'un rouge foncé.

Rostre droit, luisant, peu plus long que la moitié du prothorax, sa ponctuation assez forte, très serrée, sur le milieu formant deux stries, séparées par une carène médiane obtuse. Front moitié de la largeur du rostre, légèrement impressionné, alutacé, mat, avec une strie médiane obsolète. Tête alutacée, mate. Antennes médianes, le 1er article ovoïde, à peine plus long que large, les suivants très courts, très serrés.

Prothorax avec sa partie postérieure plus du double aussi large que longue, les côtés en arrière peu arqués, mais derrière la tubulure fortement arqués, sa plus grande largeur vers le milieu ; pulviné, criblé de points oblongs, assez profonds, très serrés, en avant confluent, la carène médiane vive, entière, la tubulure apicale avec une série de points le long de sa base et son bord antérieur ferrugineux. Ecusson arrondi, plan, lisse.

Elytres peu plus longs que larges, latéralement impressionnés vers le milieu, le calus huméral assez élevé, granulé, le calus postérieur et la dépression suturales faibles ; disque presque plan entre les 5es côtes ; sillons étroits, ponctués ; interstries dorsaux subplans, transversalement incisés, rugueux, avec une très fine arête latérale, le 5e plus élevé, granulé râpeux, les latéraux avec une fine carène. Pygidium densément et finement ponctué.

Fémurs dentés, les antérieurs médiocrement épais, leur dent plus longue et tronquée. Métasternum densément ponctué, les points pourvus de squamules cendrées, piliformes, pectinées.

Long. 2.7 mm.

Colombie, 1 ♀ (coll. *Bowring*), British Museum.

22. *Læmosaccus peruvianus*, sp. n., ♀.

Noir, peu luisant, les antennes et les tarses d'un brun de poix.

Rostre, les deux tiers du prothorax, faiblement arqué, la ponctuation en avant fine et assez serrée, en arrière plus forte et très serrée. Front presque de moitié de la largeur du rostre, mat, légèrement impressionné. Tête courte, mate. Antennes médianes fines, le 1er article

plus long que les 2e et 3e réunis, la massue assez forte, aussi longue que le funicule.

Prothorax peu plus large que long, modérément arqué sur les côtés; modérément convexe et sa déclivité antérieure graduelle dans le milieu, criblé de points oblongs, assez petits, très serrés, dans le milieu plus ou moins confluent, la tubulure apicale ponctuée, la carène médiane fine et entière. Ecusson ovale, plan.

Elytres parallèles, les lobes de la base larges, à peine anguleux et peu avancés; convexes, étroitement striés ponctués, tous les interstries fortement incisés transversalement, latéralement relevés mais obsolètement carénés, en avant granulés râpeux, le 5e plus élevé, sur toute sa longueur plus grossièrement granulé râpeux. Pygidium avec une ponctuation fine et serrée.

Dent des fémurs antérieurs obliquement tronquée à son sommet, l'extrémité externe de sa troncature aiguë.

Long. 3.3-3.5 mm.

Pérou: Cumbase, 6 ♀♀, ma collection (ex *Staudinger*).

23. *Læmosaccus lucens*, sp. n., ♀.

Noir, luisant, le prothorax de chaque côté avec une aire imponctuée, lisse, très luisante.

Rostre gros, les deux tiers de la longueur du prothorax, droit, luisant, assez densément ponctué. Front étroit, sillonné. Tête mate. Antennes médianes, ferrugineuses.

Prothorax pulviné, sa partie postérieure plus du double aussi large que longue, les côtés fortement arqués, la déclivité antérieure forte; ponctuation forte, mais irrégulière, les points profonds, oblongs, plus allongés et plus serrés devant l'écusson, très serrés sur les côtés, les aires lisses irrégulières, les intervalles des points luisants, la carène médiane médiocre, courte, atteignant à peine le milieu, la tubulure apicale lisse et luisante. Ecusson en avant largement impressionné, échancré en arc, sa partie postérieure en forme de lunule.

Elytres peu plus longs que larges, les lobes de la base forts; convexes, sillonnés caténulés, particulièrement les sillons latéraux, tous les interstries fortement relevés et carénés, le 5e plus élevé, granulé râpeux sur toute sa longueur. Pygidium densément et assez grossièrement ponctué.

Dent des fémurs antérieurs longue et tronquée. Tarses bruns. Dessous luisant, la ponctuation fine, serrée sur le métasternum, la pubescence blanche.

Long. 5-6 mm.

Brésil : Rio de Janeiro, 2 ♀ (coll. *Pascoe et Fry*), British Museum.

Cette espèce est semblable à *L. virgulatus*, dont elle se distingue immédiatement par l'absence de fovéole sur le prothorax.

24. *Læmosaccus carinipyga*, sp. n., ♀.

Brun ferrugineux, le métasternum et l'abdomen noirs.

Rostre un peu moins long que le prothorax, droit, s'élargissant sensiblement en avant, sa ponctuation serrée, fine en avant, forte en arrière. Front moitié de la largeur du rostre, impressionné. Tête mate. Antennes ferrugineuses, médianes, le 1er article allongé, le 2e plus long que large.

Prothorax ample, pulviné, sa déclivité antérieure graduelle dans le milieu, les côtés fortement arrondis dilatés, criblé de points très serrés, faiblement confluent, la carène médiane fine, atteignant le milieu ; mat, ainsi que la tubulure apicale, cette dernière en partie ponctuée. Ecusson grand, plan, dans son milieu grossièrement ponctué, sa collerette jaune.

Elytres courts, à peine plus longs que larges, assez luisants, la dépression apicale de la suture profonde, le calus huméral élevé et rugueux ; stries obsolètement ponctuées ; interstries fortement sculptés, tous fortement relevés, carénés, leur carène granulée-denticulée, râpeuse, la 3e et la 5e plus fortement. Pygidium noir, densément ponctué, sa carène très relevée en son milieu, fine aux extrémités.

Tous les fémurs dentés ; tibias antérieurs au sommet, en dedans échancrés contre l'onglet apical. Dessous et tarses à pubescence jaune.

Long. 4-6 mm.

Brésil : Goyaz, Jatahy, 4 ♀♀, ma collection (ex *Donckier*).

La coloration est variable, l'un des spécimens a les élytres presque noirs. Cette espèce a la forme de *L. firu-cornis* Champ. de l'Amérique Centrale ; elle en diffère à première vue par la dent des fémurs non tronquée, les carènes des élytres plus fortes.

25. *Læmosaccus guyanensis*, sp. n., ♀.

Noir, peu luisant, les pattes d'un rouge sanguin, les tibias antérieurs exceptés noirâtres, les antennes d'un rouge jaune.

Rostre moitié de la longueur du prothorax, un peu arqué, la ponctuation en avant fine et éparse, en arrière plus forte mais peu plus serrée. Front un tiers de la largeur du rostre, convexe en arrière, fovéolé à sa base. Tête alutacée, mate, avec quelques petits points épars. Antennes insérées vers le tiers postérieur du rostre, le 1er article oblong et deux fois aussi long que large, aussi long que les deux suivants ensemble. Yeux un peu convexes, échancrés inférieurement.

Prothorax plus large que long, les côtés assez fortement arqués; convexe, la déclivité antérieure graduelle, oblique dans le milieu, la tubulure apicale médiocre, ponctuée ruguleuse, son bord antérieur ferrugineux; criblé de gros points profonds, longitudinalement confluent dans le milieu, la carène médiane forte et entière. Ecusson arrondi, plan, avec 2-3 points, sa collerette jaune.

Elytres avec les lobes de sa base arqués, modérément saillants, le calus huméral oblong, assez élevé, finement granulé, la dépression suturale apicale assez forte; les sillons profonds, obsolètement ponctués, les interstries fortement sculptés, transversalement incisés et alutacés, faiblement relevés latéralement, les 3e et 5e plus élevés et plus fortement râpeux, les latéraux finement carénés. Pygidium alutacé, rugueux, sa pubescence assez dense et d'un gris jaunâtre.

Dent des fémurs antérieurs aiguë, celle des intermédiaires très petite, celle des postérieurs nulle. Dessous à pubescence jaune, dense sur le métasternum, la ponctuation de ce dernier forte et serrée.

Long. 4 mm.

Guyane française, Rivière de Kourou, 1 ♀, ma collection (ex *Le Moult*).

26. *Læmosaccus sculpturatus* Champ. Biol. Centr.-Amer., Col. iv. 4, 1903, pp. 282, 288.

Noir de poix, les élytres bruns, luisants, les tibias intermédiaires et postérieurs, les tarses d'un brun ferrugineux, les antennes ferrugineuses.

Rostre : ♀ moins long que la moitié du prothorax, en arrière grossièrement et densément ponctué, en avant très éparsément pointillé, cylindrique, luisant ; ♂ rugueux jusqu'au sommet. Front étroit, le tiers ♀ ou le quart ♂ de la largeur du rostre, plan et obsolètement ponctué (♀), avec un sillon médian prolongé jusqu'à l'insertion antennaire (♂). Antennes médianes, courtes, le 1er article obconique un peu moins long que les 2e et 3e ensemble, le 2e conique et plus long que large, les suivants très courts. Yeux un peu convexes.

Prothorax pulviné, modérément arqué sur les côtés, brusquement déclive en avant, criblé de points profonds, gros, en avant dans le milieu seulement confluent en sillons, le long de la base et sur les côtés serrés mais non confluent, la tubulure apicale forte, rugueuse, ferrugineuse sur son bord antérieur, la carène médiane étroite, sur la tubulure apicale obsolète. Ecusson ovale, sillonné au milieu, sa collerette cendrée.

Elytres avec les sillons dorsaux obsolètement, les latéraux distinctement ponctués, les cinq premiers interstries fortement relevés, carénés, leur sculpture forte, le 5e le plus élevé et plus fortement denticulé râpeux, les interstries latéraux peu relevés, finement carénés et finement sculptés. Pygidium rugueux.

Fémurs antérieurs avec une dent aiguë, la dent des postérieurs obsolète.

Long. 2-3 mm.

Type : Panama.

Brésil : Goyaz, Jatahy, 7 spécimens, ma collection (ex *Donckier*) ; sans localité précise, un spécimen extrait des feuilles de *Psidium araca* (G. Bondar, British Museum) ; Espirito Santo, 2 spécimens (Muséum de Dresde).

Ces spécimens ont été comparés à une paire du Panama obligeamment communiquée par le British Museum.

Parfois les pattes sont rouges, mais avec les fémurs antérieurs foncés et leurs tibias noirâtres.

Par sa forme cette espèce se rapproche de *L. castaneipennis* m. ; elle s'en distingue immédiatement par la dent fémorale aiguë, le rostre plus court et autrement sculpté, la sculpture du prothorax et des élytres.

27. *Læmosaccus frontalis** Kirsch, Deutsch. Ent. Zeitschr. 1875, p. 168 (♂).

Pérou : Pozuzu (Muséum de Dresde).

Espèce restée inconnue.

Laemosaccus chevrolati Guér. Ic. règn. anim. p. 145, t. 38, f. 1 a.

“Corselet arrondi, bossu, rugueux, avec une petite côte dorsale. Elytres d'un brun rouge assez obscur, ayant quelques petites écailles blanchâtres, rugueuses, canaliculées, arrondies au bout (ensemble d'après la figure). Rostre droit, aussi long que le prothorax, un peu rugueux, luisant et sans point au bout. Fémurs dentés au milieu (la figure les montre bidentés). Long. 10 mm. d'après la figure ‘ex Guérin.’ Brésil.”

XVII.—*New Curculionidæ (Col.) from Mauritius.*

By Sir GUY A. K. MARSHALL.

IN a small collection of Curculionidæ submitted for identification by Mr. G. E. Bodkin, Director of Agriculture, Mauritius, no less than seven species proved to be new to science. The types of these will be deposited in the British Museum.

Cratopus flavomaculatus, sp. n.

♂. Rather shiny black, with the following markings formed of dense dull yellow scales: a stripe along the inner margin of each eye; the prothorax with a large transverse patch in the anterior angles, a longer but narrower subquadrate patch in the posterior angles, and a small spot on the front margin above the coxæ; the scutellum entirely yellow; the elytra with a large common round spot immediately behind the scutellum, a few scales at the base of striæ 4 and 5, a small patch beneath the shoulders, a large transverse patch before the middle formed by the fusion of two large rounded patches with a constriction on stria 5 and extending from stria 2 nearly to the lateral margin, a small round spot behind the middle covering striæ 1 and 2, a common preapical band of four almost contiguous spots (the outer ones large and transverse, the inner small and round), and a small apical patch.

Head shallowly rugose, the forehead below the level of the eyes and broader than an eye; eyes strongly convex, highest much behind the middle. *Rostrum* very short, transverse (3 : 4), flat dorsally, with shallow rugose punctation, without any median furrow. *Antennæ* with the scape red-brown, moderately curved; funicle piceous, joint 7 transverse. *Prothorax* transverse (3 : 4), very strongly rounded laterally, widest behind the middle, not constricted at the apex, deeply and narrowly constricted just before the base, which is marginate and nearly twice as broad as the apex; the dorsum very strongly convex longitudinally, highest at the middle and there higher than the elytra, with the sculpture hidden on the squamose areas, the bare area closely granulate, in the form of a cross of which the posterior arm is much the widest, the lateral arms being half its width and the anterior arm only one-fourth; the setæ on the squamose parts long and pale, those on the bare areas darker and much shorter. *Scutellum* transverse, oval, densely squamose. *Elytra* parallel-sided from the roundly prominent shoulders to beyond the middle; the striæ deeply punctate and as broad as the intervals, there being two abbreviated accessory striæ behind the middle between striæ 3 and 4; the intervals transversely wrinkled on the basal half, without granules except at the extreme base; the setæ on the squamose areas stouter, yellow and subrecumbent, those on the bare areas finer and black, some being recumbent and others suberect. *Legs* black, with subrecumbent pale setæ, the posterior pairs of femora with a band of dull yellow scales; femora with flattened granules, the front pair much inflated and with a very large curved tooth; all the tibiæ strongly denticulate, especially the front pair, which has a stout mucro, the hind tibiæ with the corbels open.

Length 8 mm., breadth 3.5 mm.

MAURITIUS: Les Mares, 1 ♂, 30. xii. 1935 (W. F. Jepson).

In Hustache's key to *Cratopus* (Ann. Soc. Ent. France, lxxxix. 1921, p. 127) this species runs down to *convexicollis* Hust., but is readily distinguished by its characteristic yellow markings and subglobular prothorax, which at its widest is as wide as the elytra.

Cratopus anceps, sp. n.

♂. Red-brown, with head, prothorax, and front femora black; prothorax with sparse narrow grey scales; elytra with sparse narrow pale scales having a coppery reflection and a narrow denser basal band of broad pale opalescent scales.

Head coarsely and rugosely punctate, with rather sparse narrow pale scales which are denser along the eyes; forehead a little narrower than the width of an eye, with a shallow median furrow which is continuous with that on the rostrum; eyes oval, only slightly convex, highest at the middle. *Rostrum* shorter than the head, rugosely punctate, with a narrow median sulcus. *Antennæ* red-brown; the scape almost straight, reaching only to the hind margin of the eye, joint 7 of the funicle transverse. *Prothorax* transverse, moderately rounded laterally, widest behind the middle, shallowly constricted at the apex, truncate at the base; dorsum slightly convex longitudinally, highest at the middle, closely set with small granules; the scales narrow on the disk and gradually becoming wider laterally, the setæ absolutely recumbent and inconspicuous. *Scutellum* sparsely setose. *Elytra* distinctly wider than the prothorax, parallel-sided to beyond the middle, then rapidly narrowed to the apex, with only ten striæ, the two accessory striæ being absent; the striæ shallow, with deep separated punctures; the intervals somewhat broader than the striæ, with small flattened granules but not transversely wrinkled; the scales narrow and evenly distributed except for the denser transverse basal band of broad scales; the dark setæ very short, recumbent and inconspicuous. *Legs* with sparse narrow scales; the front femora moderately thickened, with a sharp simple tooth; the tibiæ not denticulate, the front pair shallowly bisinuate on the inner edge, the corbels of the hind pair open.

Length 6.5 mm., *breadth* 2.6 mm.

MAURITIUS: Corps de Garde, 1 ♂, 27. i. 1934 (*R. Mamet*).

This species belongs to the comparatively small group of the genus in which there are no accessory striæ on the elytra, and in *Hustache's* key comes between *variegatus* *Hust.* and *roseus* *Hust.* The former differs principally

in its prominent eyes, which are placed more laterally, so that the forehead is nearly twice as wide as an eye.

In *H. roseus* the scape is shorter and does not nearly reach the hind margin of the eye; the body is much more densely clothed with round scales only; the setæ at the sides of the prothorax are erect; the elytra lack the pale basal band and the pale setæ are much more conspicuous.

Cratopus hamatipes, sp. n.

♂♀. Rather shiny black or piceous black, with squamose markings; prothorax with two rather indistinct admedian stripes composed of narrow brown scales; elytra with sparse brown and blackish small setiform scales, the apical third entirely covered with fulvous scales, and before the middle a broad common transverse band of paler scales ending laterally on stria 9.

Head with shallow subconfluent punctation and sparse narrow brown scales; the forehead on a level with the eyes in ♀, slightly lower in ♂, with a median furrow continuous with that on the rostrum; eyes very convex in ♂, rather less so in ♀, highest behind the middle. *Rostrum* a little longer than broad, sculptured like the head, with a median sulcus in the basal half and a broad bare impunctate costa on each side of it. *Antennæ* testaceous, with the scape gently curved; the funicle with joint 1 not longer than 2, 7 transverse. *Prothorax* a little broader than long, moderately rounded laterally, widest at the middle, constricted at the apex, the constriction continued shallowly across the disk; dorsum longitudinally convex in ♂, almost flat in ♀, closely set with low granules. *Scutellum* transverse, sparsely setose. *Elytra* with prominent, roundly rectangular shoulders, broad in ♀, narrower in ♂, rather steeply declivous behind; the striæ with rather small deep punctures and narrower than the intervals, and with two abbreviated accessory striæ behind the middle between striæ 4 and 5; the dorsal intervals with indistinct granules and transverse wrinkles throughout, especially in ♂, and each with a single row of erect black setæ; the scales narrow and acuminate, of varying widths, the non-squamose areas with short sparse recumbent dark setæ. *Legs* testaceous, the femora more or less infusate, especially the front pair, the posterior pairs with a band of narrow pale scales; femora finely rugose,

scarcely granulate, the front pair much thicker than the others, with a stout sharp conical tooth in ♂ (smaller in ♀); tibiae distinctly denticulate in ♂, more feebly so in ♀, with a long stout mucro, near the base of the front pair in ♂ a hook-like tubercle, which is reduced to a mere rudiment in ♀.

Length 7 mm., breadth 2.7–3.3 mm.

MAURITIUS: Le Pouce, 1 ♂, 1 ♀, xi. 1933 (*J. Vinson, R. Mamet*); 1 ♂, without data (*G. Antelme*).

Most nearly allied to *C. convexicollis* Hust., 1921, from Reunion, which is a larger and more elongate insect and differs as follows:—The antennae are more elongate, with joint 7 of the funicle longer than broad; the prothorax is more strongly rounded laterally, evenly clothed (between the granules) with narrow brown scales, the granules much more sparse and flatter; in the ♂ the tooth on the front femora is not simply conical but more dilated basally on its anterior side, the front tibiae have no basal tubercle, and the hind tibiae are not denticulate.

Cratopus nubilosus, sp. n.

♀. Black, with grey or yellowish-grey scaling; prothorax densely squamose laterally and setose on the disk, but without any definite lateral stripe; elytra black on the basal half mottled with variable grey patches, sometimes forming a large humeral patch, the apical half grey with variable dark spots.

Head with indistinct shallow punctation and sparse setae; forehead flat, as broad as an eye, with a median furrow continuous with that on the rostrum; eyes convex, highest rather behind the middle. *Rostrum* longer than broad, shallowly punctate and with a broad median sulcus, set with erect pale setae in addition to the usual recumbent ones. *Antennae* honey-brown, with the scape curved and not attaining the front margin of the prothorax, joint 7 of the funicle transverse. *Prothorax* somewhat transverse, subconical, widest near the base, gently rounded laterally, shallowly constricted at the apex, the base truncate or slightly arcuate; the dorsum feebly convex longitudinally, closely set with low granules. *Scutellum* as long as broad, densely squamose. *Elytra* narrowly elongate, with rather sloping shoulders, sharply

acuminate at the apex, the posterior declivity sloping gradually from behind the middle; the striæ containing small elongate closely-set punctures, the two accessory striæ (between 4 and 5) reaching to one-fifth from the base; the intervals broader than the striæ, granulate and somewhat wrinkled transversely in the basal half; the setæ short, recumbent and inconspicuous except along the apical margin, where they are long and erect. *Legs* black, sparsely setose, only the hind femora with a broad band of narrow scales; femora finely rugulose, with traces of granules towards the apex, the front pair with a rather small triangular tooth which has a simple anterior edge; only the front tibiæ feebly denticulate and with a very small mucro, the corbels of the hind pair open.

Length 9.5–10.0 mm., breadth 3.0–3.2 mm.

MAURITIUS: Le Pouce, 2 ♀♀, xi. 1933 (*J. Vinson*).

Most nearly related to *C. leucophæatus* Boh., from Reunion, which may be distinguished by its blue-black or bronze-black ground-colour; the forehead is narrower than an eye, and the prothorax is rugosely punctate and with a broad white lateral stripe.

Cratopus fasciger, sp. n.

♂♀. Black to brown; head with a stripe of grey scales along the eyes; prothorax with a very broad lateral stripe of grey or yellowish-grey scales, with its inner margin ill-defined and uniting sparsely along the base with the opposite stripe; elytra with an ill-defined marginal stripe of grey or pale brown scales, which is narrowly produced inwards behind the shoulders as far as stria 4 or 5 and expands at the apex so as to cover nearly the whole of the declivity, a small whitish spot covering the origin of the two accessory striæ at one-fourth from the base, and a broad common whitish transverse band behind the middle, which is straight in ♂ and separately arcuate on each elytron in ♀.

Head shallowly rugose, with sparse recumbent setæ; forehead slightly wider than an eye, with a median sulcus continuous with that on the rostrum; eyes convex, highest rather behind the middle. *Rostrum* longer than broad, with close shallow punctation and a distinct median sulcus. *Antennæ* honey-brown, the scape gently curved,

the funicle with joint 7 transverse. *Prothorax* slightly transverse in ♂ (6 : 6.5), much more so in ♀ (6 : 8), rounded laterally, widest a little behind the middle, constricted at the apex; the dorsum convex longitudinally, highest at the middle, the non-squamosa median area closely set with rather large flattened granules and with scattered recumbent brown setae, the squamosa lateral areas with sparse small granules. *Scutellum* as long as broad, densely squamosa. *Elytra* with rounded subrectangular shoulders, narrower and parallel-sided to beyond the middle in ♂, much broader and somewhat dilated behind the middle in ♀, the posterior declivity moderately steep; the striae with small separated punctures and narrower than the intervals, with two abbreviated accessory striae between 4 and 5 originating at about one-fourth from the base; the intervals with very flat granules which are more or less transversely contiguous from the base to the whitish transverse band; the setae irregular and all entirely recumbent. *Legs* brown, the femora darker, with fairly dense yellowish setae, the hind femora only with a broad band of dense pale scales; femora not granulate except the front pair, which are much inflated and bear a few granules on the apical half, having also a stout tooth, which is sharply pointed at the apex and has a small angulation on its anterior edge; tibiae with a rather long stout mucro, the internal denticulation distinct on the front pair, inconspicuous on the posterior pairs, the corbels of the hind pair open.

Length, ♂ 6.5, ♀ 9.0 mm.; *breadth*, ♂ 2.5, ♀ 3.8 mm.

MAURITIUS: Corps de Garde, 1 ♂, 1 ♀, i. 1934 (*J. Vinson, G. Morin*).

Close to *C. desjardinsi* Fairm., which differs as follows: the prothorax is densely squamosa throughout, the granules being as distinct laterally as they are dorsally; the white band on the elytra is much more diffuse, especially on its anterior edge; the tooth on the front femora is much smaller and without any angulation.

Cratopus viridilimbatus Hust. var. *balteatus*, nov.

♂♀. Differs from the typical *C. viridilimbatus* Hust., 1921, in the complete absence of the broad lateral green stripe on the elytra (as also does var. *concolor* Hust.), and in having behind the middle a broad transverse band

of bright green scales which does not reach the lateral margin and extends inwards as far as stria 1 or 2.

This difference in pattern gives the insect a strikingly different appearance, but I cannot find any reliable external distinctions. The male ædeagus is also similar and of an unusual form, the tip of the apical spatula appearing as if broken off asymmetrically, leaving a very sharp right angle on one side and a longer acute angle on the other.

MAURITIUS: Bassin Blanc, 1 ♂, 1 ♀, 19.i.1933 (*J. Vinson*).

In another male, taken at the same time and place, the transverse band on the elytra is shorter, reaching only to stria 4, but in addition the scutellum is densely clothed with broad green scales (in all other forms it bears only sparse small setiform grey or coppery scales) and there is a small spot of similar green scales in the humeral angle. This form may be distinguished as var. *scutellaris*, nov.

Subfamily PISSODINÆ.

Scytha mauritiana, sp. n.

♂. Derm red-brown, with dense brown scaling, the sides of the prothorax broadly whitish, the inner edge of the white area very indefinite and on a line with stria 3 of the elytra; elytra with a large irregular whitish humeral patch and a common transverse whitish band across the top of the declivity, which is broadest on the suture and narrows laterally to stria 4, and immediately in front of the band an elongate blackish spot on interval 3.

Head when viewed from above entirely concealed by the prothorax, with dense concave pale scales and short erect clavate setæ, the forehead as broad as the base of the rostrum; the eyes flat, coarsely faceted. *Rostrum* nearly as long as the pronotum, subcylindrical, gently curved, clothed like the head on the basal half, bare and rather closely punctate apically. *Antennæ* with the funicle much longer than the club (5:3), joint 2 shorter than 1, 3-7 transverse and becoming wider distally. *Prothorax* a little longer than broad (7:6), moderately rounded laterally, widest at the middle, subtruncate at the base, shallowly constricted at the apex, the constriction continued across the dorsum, the postocular lobes strongly

developed; the dorsum gently convex longitudinally, highest behind the middle, with subreticulate punctures, which are normally almost entirely hidden by scaling, and sparsely set with very thick short clavate erect setæ, which form a fringe along the anterior margin. *Scutellum* minute, elongate. *Elytra* oblong-ovate, with obliquely prominent shoulders, not constricted near the apex, and without posterior calli; the shallow striæ containing deep separated punctures which diminish behind; the intervals broader than the striæ, 3, 5, and 7 being elevated, and these (together with 1) bearing a row of erect clavate setæ; the scales broad and overlapping. *Legs* with dense brown scaling and erect clavate setæ; femora without any tooth; anterior tibiæ not angulate internally; tarsi with joint 2 transverse and shorter than 3.

Length 2.5 mm., *breadth* 1 mm.

MAURITIUS: Le Pouce, 1 ♂, 2. xi. 1932 (*J. Vinson*).

The only other known species of the genus is *Scytha aldabrana* Champ., 1914, described from a single male from Aldabra, which differs from the present species in several striking characters: the femora all bear a sharp tooth, the front tibiæ are angulate on the inner edge, joint 2 of the tarsi is longer than broad and longer than 3, the antennal funicle is only as long as the club, the body and legs entirely lack the erect peg-like setæ, etc.

Subfamily COSSONINÆ.

Pentarthrum mauritianum, sp. n.

♂♀. Black to piceous, shiny, almost bare.

Head shallowly constricted laterally just behind the eyes, with the vertex impunctate; the forehead shallowly depressed, with small separated punctures and an obsolescent median fovea; eyes slightly convex, highest at the middle. *Rostrum* rather more than twice as long as broad, parallel-sided, the dorsal outline straight in the basal two-thirds, then curving downwards to the apex, punctate throughout, the small shallow punctures tending to become longitudinally confluent in ♂, smaller and more isolated in ♀. *Prothorax* as long as broad, strongly rounded laterally in ♂, less so in ♀, narrowly constricted at the base, which is marginate, more broadly so at the apex; the dorsum rather markedly convex longitudinally

in ♂, less so in ♀, with small isolated punctures which are separated by more than their own diameter, the lateral ones containing a minute recumbent seta, without any impunctate median line. *Elytra* oblong-ovate, rather rapidly narrowed at the apex, with roundly rectangular shoulders; the very shallow striae containing small isolated punctures, striae 6-8 more or less confused in the basal third; the intervals broader than the striae, each bearing a single row of minute punctures, interval 9 carinate on its upper edge in the apical two-thirds; minute setae on the apical area only. *Legs* rather long, with sparse minute setae; hind femora reaching the apex of ventrite 4; joint 3 of tarsi broader than 2, lobate. *Underside* with small sparse punctures.

Length 3 mm., *breadth* 1 mm.

MAURITIUS: Pointe aux Feuilles, 2 ♂♂, 1 ♀, x. 1933 (*R. Mamet*).

Nearly allied to *P. rodriguessi* Waterh., 1876, which differs as follows: the prothorax is less strongly rounded laterally, less convex dorsally, with much coarser punctures; the elytra are proportionately shorter and broader, and the punctures much larger, being as broad as or broader than the intervals, except in stria 1, in which they are much smaller; the legs are much shorter, the hind femora reaching only the apex of ventrite 2.

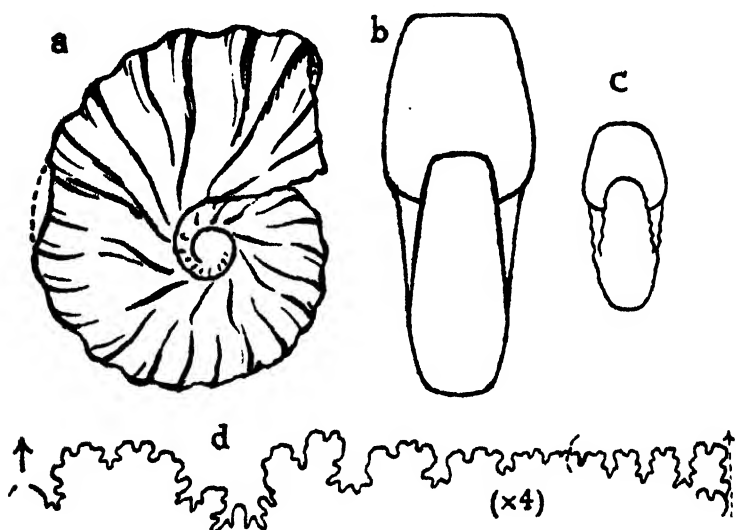
XVIII.—*The Canadian Ammonite Genus Gastrolites in the English Gault.* By L. F. SPATH.

DURING the last few years several interesting or new Gault ammonites have been found, especially at Folkestone, whence Mr. R. Casey has sent me a number of examples which he recognized as different from the forms described in my Gault Monograph. I have already referred to some of the new finds in a recent note *, and Mr. Casey † himself intends to record the more interesting or new species, but he has kindly asked me to describe

* Spath, Field Meeting at Folkestone, Kent. Proc. Geol. Assoc. vol. xli. 1935, p. 429.

† A note by Mr. Casey, entitled "Recent Additions to the Albian Ammonoid Faunas of Folkestone," has since appeared in the 'Geological Magazine' (October 1936, pp. 444-48).

the most important find of all, namely an ammonite which not only belongs to a genus entirely new to England and Europe, but which is extremely close to species of the Canadian western interior, *i. e.*, Alberta and British Columbia (*Gastrophiles canadensis* Whiteaves sp., and allies), hitherto referred to the Lower Albian with some hesitation. Apart from enabling us now to give a more definite date to the upper part of the Peace River Formation of Alberta, the new ammonite, like the southern genus *Engonoceras* discovered some years ago, shows



Gastrophiles cantianus, sp. n. Side-view (a) and outline whorl-section (b), also of inner whorls (c), with suture-line (d) enlarged, $\times 4$. Gault, bed VIII., *cristatum* zone, Folkestone (R. Casey Coll.).

that elements of entirely different marine provinces can and do occur in the English Gault. The discovery is thus as important from the palaeogeographical point of view as the discovery of a Himalayan Eotriassic fauna in East Greenland. Unfortunately we are as yet incompletely informed about the Cretaceous of East Greenland and Spitsbergen, in both of which areas doubtful *Archthoplites* have been found and in which *Gastrophiles* is likely to occur.

Description.

The new form, for which I propose the name *Gastrolites cantianus*, sp. n., may be characterized as follows:—

Diagnosis.—Shell rather high-whorled (subplatygyral), rather inflated (subpachygyral), fairly involute (subangustumbilicate). Whorl-section subrectangular in adult, with gently convex sides, flat venter, and high umbilical wall, but rounded edge. Greatest thickness near umbilical border. Inner whorls with rounded and almost smooth periphery. Flat, broad ribs, flexuous, and prorsiradiate, indistinctly bifurcating or intercalated, about 10 at umbilical end and 22 at periphery, continuous across venter, with concave interspaces about as wide as the ribs. Suture-line with very unsymmetrical first lateral lobe and low, simplified saddles.

Measurements.—

Diameter.....	46 mm.
Height of last whorl ...	46 per cent.
Thickness of last whorl .	41 ,,
Umbilicus	19 ,,

Horizon and Locality.— Gault, Junction Bed 8, *cristatum* zone, Folkestone (R. Casey Coll.).

Affinities.

Gastrolites cantianus, sp. n., combines the lateral aspect of *G. kingi* McLearn * with the peripheral aspect of *G. canadensis* (Whiteaves) †, but it differs in dimensions as well as in other features from all the Canadian species described by McLearn. These differences, however, are of not more than specific importance, and the suture-line of the new form is almost identical with that of some of the Canadian species. On a previous occasion ‡ I expressed the opinion that this almost pseudoceratitic suture-line of *Gastrolites* and its external resemblance to *Knemiceras* made the genus somewhat intermediate between the Hoplitidæ and their offshoots, the Engono-

* "The Ammonoid Genera *Gastrolites* and *Neogastrolites*," Trans. Roy. Soc. Canada, (3) sect. iv. vol. xxvii. p. 19, pl. iii. figs. 4-5 (1933).

† See *ibid.* p. 15, pl. i. figs. 4-5.

‡ Spath, "The Ammonoidea of the Gault," Monogr. Pal. Soc. pt. viii. pp. 340, 342 (1931).

ceratidæ, but the Pseudoceratites, which are not a natural unit, include derivatives of many other families.

The Hoplitid origin of the present form is beyond dispute. The external suture-line is that of a typical *Anahoplites**, and even the internal portion differs only in having shorter and simpler saddles. Moreover, up to a diameter of 15-20 mm. the rounded periphery resembles that of many immature Hoplitids, especially *Dimorphoplites*, although *Arcthoplites jachromensis* (Nikitin)†, in spite of its rather complex suture-line, is probably more closely related. *Gastrolites*, of upper Meso-Albian age, in fact, is probably a descendant of the same stock that gave rise to *Arcthoplites*, of basal Meso-Albian age (*dentatus* zone); while *Neogastrolites* McLearn, being much later than *Gastrolites*, from which it seems to be derived, must be of upper Neo-Albian age. That the fundamental stock is the group (*Deshayesites*?), which I‡ discussed in connection with an almost identical Indian equivalent, is suggested by the very similar suture-line, but other Parahoplitid offshoots (*Pseudosonneratia*, *Hypacanthoplites*, *Cymahoplites*) of the Lower Albian are also close to the other genera here discussed. Until *Arcthoplites* especially is more completely known it is impossible definitely to name the ancestor of *Gastrolites*.

I agree with McLearn§ that the successive Lower Cretaceous faunas of Alberta and British Columbia came from the north, whereas the earlier (Aptian) fundamental stock (*Deshayesites*?, ex Desmoceratidæ) is almost universal. *Gastrolites* in the English Gault is thus also apparently an immigrant from the Arctic Province, while *Engonoceras* is a straggler from the south, two solitary strangers among the indigenous and wonderfully varied and prolific Hoplitid faunas.

* Compare, e. g., Spath, *loc. cit.* (Gault Ammonoidea), pt. iii. p. 145, text-fig. 145 g (*Anahoplites daviesi* Spath).

† "Les Vestiges de la Période Crétacé dans la Russie Centrale," Mém. Com. géol. St. Pétersb., vol. v. no. 2, p. 57, pl. iv. figs. 1-7 (1888).

‡ Spath, "Revision of the Jurassic Cephalopod Fauna of Kachh (Cutch)," Pal. Indica, n. s. vol. ix. no. 2, pt. vi. p. 801 (1933).

§ "Problems of the Lower Cretaceous of the Canadian Interior," Trans. Roy. Soc. Canada, (3) vol. xxvi, section iv. pp. 170, 172 (1932).

XIX.—*Notes on Mallophaga*.—V. By GORDON B. THOMPSON (Department of Entomology, British Museum of Natural History).

ON THE SPECIES OF MALLOPHAGA DESCRIBED BY
THEOBALD (1896).

In his book 'Parasitic Diseases of Poultry,' pp. 26–29, fig. 8 (Gurney & Jackson, London, 1896), F. V. Theobald described, under the name of *Goniodes eynsfordii*, a species of Mallophaga from the "domestic fowl" which appears to have been overlooked by workers on the Mallophaga. I have made efforts to trace the type-specimens of this species, but have been unsuccessful—for the present, therefore, they must be regarded as lost. For help in this matter I have to record my thanks to Mr. S. G. Jary, of the South Eastern Agricultural College, Wye, Kent. Owing to the extreme rarity of this book it is understandable that neither Kellogg (1908) nor Harrison (1916) included the species in their lists of the species of Mallophaga. I am therefore reproducing below Theobald's original description:—

Goniodes eynsfordii Theobald (1896).

"Tick-like in appearance. Ground colour of female pale yellowish white or grey, the lateral bands dark shining chestnut-brown. A double pair of horizontal lateral stripes on each segment, chestnut-brown in colour, much darker towards their outer edges, and forming a ready feature of distinction for the species. Four long bristles on front of head and two large pairs of posterior ones. The 5-jointed antennæ slightly hairy at tip. Metathorax with four lateral bristles. Four anterior abdominal segments with a single lateral bristle, fifth and sixth with two lateral bristles, seventh with four. Anal segments bilobate, with four long and two short bristles. Each segment has four central and three pairs of lateral bristles, except the last, which has two large central ones. Legs thick, a single bristle on the tip of each tibia.

"The male is narrower than the female, bright yellowish brown, borders of the segments very dark brown. Five pairs of fine bristles on the head and one large one on each

side of the posterior angle. Each abdominal segment with a pair on each side. Abdomen dark in centre. Legs not so thick as in the female; three hairs on femora of second and third pairs.

"Length: ♀, 2.6-2.7 mm.; in ♂, 2.8-2.9 mm.

"This species does not seem to leave the head and neck. It is especially abundant in chicks in the above-named portions. Specimens were first sent to me by Mr. Till, of Eynsford, who finds they are most prejudicial to the health of the birds. They are found with their heads buried in amongst the feathers and their bodies in the air, just like a tick. A full account of this species will be found in the Journal of the S.E. Agric. Coll., no. 5."

I have been unable to trace any reference to the species in the Journ. S.E. Agric. Coll. no. 5. On the evidence of Theobald's figure of the female this species is *Lipeurus heterographus* Nitzsch in Giebel (1866).

ON THE SPECIES OF MALLOPHAGA DESCRIBED BY PONTON (1870, 1871).

T. Graham Ponton described five species of Mallophaga as new in the 'Monthly Microscopical Journals' for 1870 and 1871. He was an assistant curator in the Bristol Museum during the period 1867-1871. I have made efforts to trace Ponton's types, but have so far been unsuccessful, and they must for the present be regarded as lost. I am indebted to Mr. H. Tetley, Curator of Zoology at the Bristol Museum and Art Gallery, for information regarding Ponton and also for his efforts to trace Ponton's types. As the descriptions are not readily accessible I am reproducing them below, together with bibliographies and notes on the species.

1. *Trichodectes tigris* Ponton * (1870).

Mon. Micr. J., London, iv. pp. 147-148; Piaget, 1880, Les Pédiculines, p. 391; Kollogz, 1908, Genera Insectorum, Fasc. 66, p. 8; Harrison, 'Parasitology,' ix. p. 73 †.

* In the original paper Ponton's name was spelt "Penton," but I understand the correct spelling is Ponton. The generic name of the louse was spelt "*Tricodectes*," an obvious mistake.

† Harrison (1916) gives the wrong volume.

Type-host :—*Panthera tigris* Linné.

The original description is as follows :—

“Pale fulvous, head and thorax fulvous yellow, abdomen yellowish white, somewhat quadrate.

“Head transverse, vertex concave, with two trapeziform black spots in the centre, lateral margins situated before the eyes, a black spot at the anterior angle passing to the base of the antennæ and uniting with the diagonal fasciæ on each side of the occiput. Prothorax subconical smaller than the head. Metathorax transverse narrower than head, posterior margin concave ciliated. Abdomen broadly ovate, hairy. Antennæ, front joint large, subcylindrical; second, smaller; third, clavate and recurved. Legs moderate, tibiæ clavate; unguis slender incurved.

“Length 1.2 mm.”

In the short introductory note to the above description Ponton says that he sent specimens to Denny, who agreed that they represented an undescribed species of *Trichodectes*. No locality is given, and the only indication of the origin of the specimens is in the statement that they were given to the author by Charbonnier, who was a well-known Bristol entomologist.

2. *Menopon ptilonorhynchi* * Ponton (1871).

Mon. Micr. J., London, vi. p. 8, pl. xci. f. 1; Gurlt, 1878, Arch. Naturgesch. p. 175; Harrison, 1916, 'Parasitology,' ix. p. 43.

Type-host :—*Ptilonorhynchus violaceus* Vieillot (= *P. holosericeus*).

The original description runs as follows :—

“Colour bright fulvous. Head obtusely subtriangular; clypeus rotundate, vertex rounded, base concave. Two broad irregular chestnut markings extend from the insertion of the antennæ to the eyes, which are connected at that point by a semilunar chestnut line, a chestnut spot in the centre of the clypeus; prothorax elliptical; metathorax transverse; abdomen ovate, hairy; all the segments, except the last, have a chestnut spot; legs long, tarsi clavate.

“Length, 2.115 mm.”

* Harrison (1916) lists a species, *Philoaterus ptilonorhynchi* Ponton, off *Ptilonorhynchus holosericeus*, but this is an error. Ponton described only the two species listed in the present paper from this host.

3. *Degeeriella pontoni* *
Johnston & Harrison (1912).

Proc. Roy. Soc. Qld. 1912, xxiv. p. 12 (nom. nov. for *Nirmus nitzschii* Ponton, nec Giebel, 1866, p. 364; 1874, p. 125); Harrison, 1916, 'Parasitology,' ix. p. 121.

Nirmus nitzschii Ponton, 1871, Mon. Mier. J., London, vi. p. 8, pl. xci. f. 2; Gurlt, 1878, Arch. Naturgesch. p. 175; Piaget, 1880, Les Pédiculines, p. 164; Kellogg, 1908, Genera Insectorum, Fasc. 66, p. 27.

Type-host :—*Ptilonorhynchus violaceus* Vieillot (= *P. holosericeus*).

The original description of *Nirmus nitzschii* Ponton (nec Giebel, 1866) is as follows :—

"Colour pale yellowish-white. Head panduriform, clypeus rounded, antennæ rather long, second joint longest. Prothorax not so wide as the head; metathorax oblong, trapeziform. Abdomen lanceolate, a long fascicle of hair between each of the four last segments. Legs somewhat clavate. Length 2.538 mm."

As an introductory note to the description of this species Ponton remarks :—"The species is probably the same as that mentioned in Giebel's list of the Halle collection, without either name or description."

4. *Philopterus dennyi* (Ponton) (1871).

Mon. Mier. J., London, vi. p. 8, pl. xci. f. 3; Gurlt, 1878, Arch. Naturgesch. p. 177; Piaget, 1880, Les Pédiculines, p. 76; Harrison, 1916, 'Parasitology,' ix. p. 92.

Type-host :—? *Momotus mexicanus* Swainson (= *Prismites mexicanus*).

The original description is as follows :—

"Colour tawny. Head triangular, clypeus produced entire; trabeculæ large, broadly truncate; antennæ rather long. Clypeus bordered by a chestnut line, with a transverse semilunar marking of the same colour, a similar one on the occiput; a broad irregular chestnut mark extends from the eyes to the prothorax. Prothorax transverse, angles rounded, metathorax transverse. Abdomen ovate, hairy; pale fulvous, with a chestnut border. Length 3.173 mm."

5. *Trichodectes leporis* Ponton (1871).

Mon. Micr. J., London, vi. p. 8, pl. xci. f. 4; Gurlt, 1878, Arch. Naturgesch. p. 165; Piaget, 1880, Les Pédiculiens, p. 407; Kellogg, 1908, Genera Insectorum, Fasc. 66, p. 7; Harrison, 'Parasitology,' ix. p. 70.

Type-host :—" *Lepus cannabinus* " *.

The original description runs as follows :—

" Colour bright fulvous yellow, a dark chestnut spot at the eyes connected by a diagonal line with a line of the same colour on the occiput. Head suborbicular; clypeus rounded, vertex convex, lateral margin deeply sinuated; eyes prominent; antennæ small, last joint broadly clavate; prothorax transverse; metathorax not so wide as the head. Abdomen ovate, fulvous, hairy. Tibiæ clavate. Length 2.538 mm."

Harrison (1916, p. 70) regards this species as a straggling *Colpocephalum* and therefore unrecognisable. The figure definitely lends support to this conclusion, and I am in agreement with Harrison that the name should be discarded, more especially in view of the fact that it is recorded off a host belonging to a group from which Mallophaga have never been taken.

It is of interest to note that in the same volume of the journal as the above descriptions (sp. 2-5) appeared, there is a letter to the editor written by H. C. Reichter, dated July 8th, 1871, on p. 107, which reads as follows :—
" . . . Without entering upon the many structural inaccuracies with which Mr. Ponton's plate is literally crowded, I wish simply to notice two errors, which, if uncorrected, are enough to throw the whole subject into confusion. In fig. 3, a presumed new species of the subgenus *Docophorus*; the legs end in single claws, whereas all the species of the subgenus *Docophorus* . . . have a pair of claws proceeding from their short two-jointed tarsi. The *Trichodectes*, fig. 4, is figured with double claws, the chief character of the genus being that they are single. In fact, all the species of the obsolete order 'Anoplura' which infest mammals, have single tarsal claws."

* I have been unable to trace this host in the literature.

XX.—*A Pelagic Nudibranch of the Family Phyllirhoidæ from the Waters of New South Wales: a Note on the Subgenera Ctilopsis and Cephalopyge.* By WILLIAM J. DAKIN, D.Sc., F.Z.S., and ALAN COLEFAX, B.Sc.

IN a recent paper (Dakin and Colefax, 1936) on the anatomy and zoological position of some specimens of a rare pelagic Nudibranch captured in our plankton catches off the coast of south-eastern Australia, we referred our examples to the family Phyllirhoidæ, and made comparisons with a species of *Ctilopsis* described by André (1906).

Unfortunately, owing largely to the coincidence of another paper being written on specimens which had been discovered in the Northern Pacific a very short time before ours, and partly due to the disadvantage of the literature situation in Australia, we were not aware of a paper by Kikutaro Baba (1933) in which this Northern Pacific form has been described. The situation brought before us by a perusal of his paper necessitates this further note, especially since the matter of taxonomy is further complicated by the fact that two of the authors who discussed the rare specimens of this group had, like ourselves, not seen certain descriptions in earlier literature.

Our paper, to which reference is made above, was primarily written in order to set out the anatomy of a planktonic Nudibranch which had never before been taken in the Southern Pacific. As a result of this study we recognized that our specimens were very like those described by E. André in 1906. But André's figures are rather poor, and there were certain differences in description which left it impossible (in our opinion) to describe the New South Wales specimens as a new species of the genus *Ctilopsis* André.

Baba (1933) described certain details of the anatomy of several specimens of a small Nudibranch collected by tow-net at night in Shimizu Bay, Japan. As a result he regarded them as related quite closely to André's species *Ctilopsis picteti*, but on account of certain differences he created a new species for his specimens, and they are established as *Cephalopyge (Ctilopsis) orientalis* Baba. Actually they resemble our Southern Pacific

specimens more than they resemble those of André. So the question now arises whether our species is distinct from *Ctilopsis picteti* André or from *Cephalopyge* (*Ctilopsis*) *orientalis* Baba, or whether all these are varieties of one and the same form.

It is strange that the few known specimens of a section of the family Phyllirhoidæ should have been the cause of no little taxonomic confusion. This is probably consequential on changes in shape resulting from different methods of preservation. On studying the literature of the group, however, there can be no doubt that the species described as *Cephalopyge trematoides* by Hanel (1905), the species *Boopsis mediterranea* described by Pierantoni (1923) and *Ctilopsis picteti* described by André (1906), together with the species of Baba (1933) and those taken by us (1936), are all species of the same genus; and consequently we may at the outset accept the decision of Thiele (1931) that they are all species of *Cephalopyge*, which generic name has priority. Thiele, however, introduced two subgeneric titles in order to separate André's *Ctilopsis picteti* from the other known species. According to Thiele there are in the family Phyllirhoidæ two genera *Phyllirhoë* and *Cephalopyge*—and the classification of the genus *Cephalopyge* would be as follows:—

Fam. Phyllirhoidæ.

Genus CEPHALOPYGE Hanel, 1905.

Subgenus CEPHALOPYGE.

Syn. *Boopsis* Pierantoni, 1923.

Cephalopyge (*Cephalopyge*) *trematoides* Chun, 1889. Canary Islands.

Cephalopyge (*Cephalopyge*) *mediterranea* Pierantoni, 1923. Mediterranean Sea.

Subgenus CTILOPSIS André, 1906.

Cephalopyge (*Ctilopsis*) *picteti* André, 1906. Malay Straits (Amboina).

Cephalopyge (*Ctilopsis*) *orientalis* Baba, 1933. Japan.

Cephalopyge (*Ctilopsis*), ? sp. n., Dakin & Colefax, 1936. South-east Australia.

Whilst all these species bear certain remarkable resemblances to one another, there are interesting slight differences between them. It should be pointed out also that they are very rare indeed in marine collections, and the localities where they have been found are all widely separated in the world's seas.

First let us note the differences which mark the two subgenera. The only feature which has been used definitely in this respect appears to us to be the presence of a developed foot—a little projection below the head figured by Hanel and Pierantoni. There is certainly no indication in our specimens of any projection at this point. Baba (1933), in his description of the species *orientalis*, states: "foot in the preserved state not well developed." This is rather indefinite considering its importance in classification, and especially since in the text the same author states that the "present Nudibranch agrees with the genus *Cephalopyge* in the presence of a foot." One is left wondering whether the size of the projection figured by Pierantoni is really only a matter of preservation or a matter of protrusion or retraction in the specimens examined, a possibility already envisaged by Pruvot (1929).

There is certainly no trace of a projecting foot, or the least development of such an organ in our specimens (which, it may be noted, are rather large as known specimens of the genus go). André says a foot is but little developed, and figures no projection in his illustrations at all.

Possibly there is a graded difference in the development of this organ in the different known forms, but until a closer examination is made of living specimens it will remain uncertain to what degree the anterior projection figured strongly for *Cephalopyge mediterranea*, and almost as much for *Cephalopyge trematoides*, is a real distinguishing character or a matter of the temporary activity of the animal itself at the time of fixation.

This result, however, leaves it rather difficult to say whether the genus should really be divided into subgenera at all; whether one should not rather consider all the specimens as species of the single genus *Cephalopyge* without bracketing certain of them together. We are inclined to regard this as the better scheme, especially since the only other distinct feature which Baba can

set out as differentiating the forms into subgenera is the length of the anterior hepatic sac. But, as will be noted shortly, the condition of this organ in our specimens (which appear as if they should be placed very near to *Cephalopyge orientalis* and *C. picteti*) removes the significance of this character as a distinguishing mark of the subgenera.

Let us then turn our attention to the possibility of there being five different species.

As noted above, the general anatomy appears to be very much the same so far as the descriptions and figures enable one to judge. The body-size of the different species differs, however, significantly. Thus *Cephalopyge trematoides* and *Cephalopyge orientalis* range between 7 and 10 mm. in length. *Cephalopyge picteti* (André) is given as only 3-10 mm. The length of *Cephalopyge mediterranea* is given as 15-18 mm., and our specimens range between 12 and 17 mm.

In size and form André's *Cephalopyge picteti* seems now the most aberrant, but this is very probably due to the figures or the state of preservation of the specimens. They were examined ten years after having been collected, and the illustrations are not very good.

The projecting foot, which is the most important distinction differentiating *C. trematoides* and *C. mediterranea* from the rest, has already been dealt with above.

A much more definite feature of difference is the condition of the jaw-plates and radula. A radula is definitely described by Hanel, and by Pierantoni, for the species *C. trematoides* Chun and *C. mediterranea* Pier. A very rudimentary radula was also found by André in *C. picteti*. Now it was one of the causes for our hesitation in claiming identity of the New South Wales form with André's species that we could find no radula either in sections or teased preparations. And Baba has also to confess that he could find absolutely no traces of this organ in "all the specimens" of *C. orientalis* examined by him. It is difficult to believe that we could have missed this structure, so one must assume for the present that the radula (which is admitted to be extremely reduced in those species in which it is present) is missing altogether in *Cephalopyge orientalis* Baba, and also in our New South Wales specimens.

The next feature which has been utilized for taxonomic purposes is the number of the gonads—the hermaphrodite glands. Here there is a remarkable grading in the four named species. *C. trematoides* has five such organs, *C. mediterranea* has two only, *C. orientalis* has four, and *C. picteti* has three. Baba uses this gonad number as one of the distinguishing characters of his species.

The structure of the glands is remarkably similar in all species—it is only the number which appears to vary. At first sight there seemed to be only two glands in some of our specimens. Closer examination showed that what was taken to be one apparent gland might well be regarded as two—one in front of the other, and both close together—and we eventually described the specimens as having three hermaphrodite glands. After reading Baba's paper, a closer examination of another series of microscope-sections has been made of another of our specimens, and it has been found that it could easily be claimed that there were *four* distinct hermaphrodite glands. But if it requires a close examination of serial sections in order to determine whether there is one gland, or two separate ones in close juxtaposition, it is extremely likely that there may really have been four in André's species and more than two in Pierantoni's. We can only surmise this possibility, but at least it makes us regard the number of hermaphrodite glands as a rather doubtful factor determining the species.

The remaining character on which a distinction between the species is based is given as the length of the anterior hepatic sac. This is set out in Baba's table of characters. In *C. trematoides* and *C. mediterranea* the anterior hepatic sac is rather long. In *C. orientalis* it is rather short, and the same condition holds good for *C. picteti*. In all our specimens the anterior hepatic sac is definitely quite long. If this feature is to be regarded as a really characteristic and reliable one for taxonomic purposes, then there is a distinct difference between our specimens and those of André, and Baba, and we can only conclude that the New South Wales form is a new species, or at least a variety. One would then regard the known specimens of this rare pelagic Nudibranch genus as belonging to five species, with but small differences

between them. At the same time two of the species which should be regarded as belonging to Thiele's subgenus *Ctilopsis* would have a short anterior hepatic sac and the other species would have a long one. But the resemblance between *Cephalopyge orientalis*, from Japan, and our New South Wales specimens is so close that we still do not regard it as legitimate to create another species for the latter. We should prefer them to be considered as a Southern Pacific form of *Cephalopyge orientalis* Baba until more is known of living specimens in both areas.

SUMMARY AND GENERAL CONSIDERATIONS.

The specimens of the rare pelagic Nudibranch of the family Phyllirhoidæ recorded by us from the waters of New South Wales seem to be a southern variety of *Cephalopyge orientalis* Baba of the Northern Pacific. A description of the anatomy has been given in our previous paper (Dakin and Colefax, 1936). There are, consequently, four known species of the genus *Cephalopyge*, which occur in the Atlantic (Canary Islands), in the Mediterranean Sea, the Malay Archipelago, and the Pacific Ocean respectively. These species present only slight and graded differences, and it is very doubtful whether they should be grouped under two subgenera. The generic name *Ctilopsis* of André is thus to be regarded as a synonym of *Cephalopyge* Hanel, 1905.

BIBLIOGRAPHY.

- ANDRÉ, E. 1906. "Supplément aux Mollusques d'Amboine et description d'un nouveau genre de la famille des Phyllirhoides." Rev. Suisse Zool. Tom. 14, Fas. i. pp. 71-80.
- BABA, K. 1933. "A Pelagic Nudibranch, *Cephalopyge orientalis*, sp. n., from Japan." Ann. Zool. Jap. vol. xiv. pt. i. pp. 157-160.
- CHUN, C. 1889. "Bericht über eine nach den Canarischen Inseln im Winter 1887-88 ausgeführte Reise." Sitzungsber. Akad. Berlin, pp. 519-553.
- DAKIN & COLEFAX. 1936. "*Ctilopsis*, a rare Pelagic Nudibranch of the Family Phyllirhoidæ." Proc. Zool. Soc. Lond. 1936, pt. ii. pp. 455-460, pls. i.-iv.
- HANEL, E. 1905. "*Cephalopyge trematoides* Chun, eine neue Mollusken-Gattung." Zool. Jahrb. Syst., Bd. 21, Heft 4, pp. 451-466.
- PIERANTONI, U. 1923. "Sopra un nuovo Phyllirhoidæ del Golfo di Napoli (*Boopsis mediterranea*, n. g., n. sp.)." Pubbl. Sta. Zool. Napoli, vol. v. Fas. i. pp. 83-96.
- PRUVOT, M. 1929. "Note sur un rare Mollusque pélagique de la Méditerranée, *Boopsis mediterranea* Pierantoni." Bull. Soc. Zool. France, Tom. 54, pp. 467-476.
- THIELE, J. 1931. 'Handbuch der systematischen Weichtierkunde,' Th. 2, p. 446.

XXI.—Entomological Expedition to Abyssinia, 1926-7:
Coleoptera, Carabidæ and Cicindelidæ. By CHARLES ALLUAUD, Les Ouches-à-Crozant, Creuse, France. With Introductory Note and Appendix on Cicindelidæ by HUGH SCOTT, Sc.D., Department of Entomology, British Museum (Natural History).

[NOTE.—This paper deals with the greater part, but not the whole, of the material of this family collected by the Expedition. A report on the Trechinæ by Dr. Jeannel has already appeared (Rev. française d'Ent. ii. pp. 205-212, Jan. 1936), in which are described four new species of *Trechus* found on the summit of Mt. Chillálo, at an altitude above 12,000 feet, at the roots of plants and in damp moss; these are regarded by Jeannel as indicating the presence there of a large association of species of *Trechus*, comparable perhaps to that on Mt. Elgon, and comprising blind and microphthalmous forms as well as those with fully developed eyes, to which category the four actually discovered belong. Moreover, the four species display more marked northern affinities than those of Mt. Elgon, and approach certain species discovered long ago by Raffray on the Abyssinian mountains much further north.

Certain species of *Bembidion*, also from the summit of Mt. Chillálo, have been described by Dr. Netolitzky (Wien. ent. Zeit. xlvii. pp. 169-183, 1931). A comprehensive account already completed by him on the genera *Bembidion* and *Tachys* includes nine forms of the former and sixteen forms (species or subspecies) of the latter, represented mostly by long series. This article will appear shortly in the 'Annals and Magazine of Natural History.'

Even these two reports and the present paper will not cover the whole family. There remains a residue of representatives of various genera of Anchomenini and other genera which no specialist has yet undertaken.

In the present paper the most interesting features are (i.) the description of five new species of *Calathus*, found, one on Mt. Zukwala and four on Mt. Chillálo, at altitudes from 9000 to nearly 13,000 feet, representatives of a genus in which the majority of the species are Palearctic or Nearctic, though some Abyssinian species

were previously known (but none from other parts of tropical Africa); and (ii.) a new species of *Zargochilus* from an altitude of 10,000 feet on Mt. Chillálo, this genus having been previously recorded only from Kilimanjaro. A new species of *Chlænius* is also described, and new records are given of species representing many genera. Several are included from among material collected by H. Uhlenhuth at Dire Dawa, and acquired by the British Museum subsequent to the Expedition; the determination of these is due to Mr. E. B. Britton, who has also helped in the taxonomic arrangement of the paper.

Types and paratypes of the new species are in the British Museum; paratypes also in Monsieur Alluaud's collection.—H. S.]

CARABIDÆ : CARABINÆ.

Carabini.

Carabomorphus abyssinicus Gestro.

Loc. Abyssinie : Addis Ababa, British Legation, 13. x. 1926, 1 ex. (*Omer-Cooper*); Mt. Zukwala, 9000 pieds environ, 24-5. x. 1926, 3 ex. (*Omer-Cooper*); tous déterminés par Dr. S. Breuning. Connu seulement d'Abyssinie.

Carabomorphus gestroi Breuning.

Quoique entièrement noire avec les cuisses rouges et sans les remarquables bandes jaunes des élytres, cette espèce n'est peut-être qu'une race du *C. antinorii* Gestro. L'exemplaire unique trouvé par Scott est une femelle avec forte dépression longitudinale de chaque côté de la suture.

Loc. Abyssinie : Mt. Chillálo, "moorland, between 12,000 and 13,000 feet, under stones or moss beneath alpine plants," 18. xi. 1926, 1 ex. (*Scott*).

Stagonini.

Siagona sp.

Loc. Abyssinie : Mt. Chillálo, 8000 pieds environ, 6-8. xi. 1926, 1 ex. (*Scott*). Ce spécimen a été vu en 1930 par Herr M. Bänninger, qui a noté que la même espèce se trouve dans le pays Somali.

Scaritini.*Clivina natalensis* Putz. (?).

Loc. Abyssinie : ravin d'Akaki, près d'Addis Ababa, entre 6500 et 7000 pieds, 17. x. 1926, 1 ex. (*Scott*) ; aux bords d'une rivière au sud-ouest de Mt. Zukwala, 6000 pieds environ, 31. x. 1926, 2 ex. (*Omer-Cooper*) ; lacs d'Addas, Hora Bishoftu, 7000 pieds environ, 2. xii. 1926, 1 ex. (*Omer-Cooper*) ; Mulu, au-dessus de la vallée du Muger, à 8000 pieds environ, aux bords des torrents, 18-23. xii. 1926, 4 ex. (*Scott*).

Si non identiques, ces spécimens sont au moins très rapprochés à l'espèce sud-africaine.

HARPALINÆ.**Cymbionotini.***Cymbionotum* * *schüppeli* (Dejean).

Siagona schüppeli Dejean, 1825.

Graniger rufotestaceus Fairmaire, 1893.

Loc. Abyssinie : " Hawash railway station, 3500 feet, 2. ix. 1926, 3 specimens, attracted by light " (*Omer-Cooper*). Cette espèce est répandue en Égypte, Syrie, le Soudan, le pays Somali, et l'Afrique orientale (Kilimandjaro).

Pterostichini.*Amara abyssinica* Raffray, 1885.

Amara æthiopica Tschit. 1898.

Loc. Abyssinie : Forêt Djem-Djem, lisière de la forêt, 9000 pieds environ, 4. x. 1926 (*Scott*) ; Wouramboulchi, au delà de Djem-Djem, 9000 pieds, x. 1926 (*Omer-Cooper*) ; Mt. Chillalo, zone des bruyères, 10,000 pieds environ, xi. 1926 (*Scott*) ; 11 ex. Espèce découverte originairement sur le Mont Abouna-Yousef, à 4000 mètres (plus de 13,000 pieds), en septembre, sous les pierres.

Genre CALATHUS Bonelli.

Le nombre important de *Calathus* nouveaux rapportés du Mt. Chillalo (où aucune des espèces déjà décrites

* *Cymbionotum Baudi* 1864 doit remplacer *Graniger Motschulsky* 1864, nom actuellement applicable à un autre genre. *Coscinia* Dej. 1881, l'ancien nom, est préoccupé. Voir H. E. Andrewes, Trans. Ent. Soc. London, lxxxi. p. 3, 1933.

d'Abyssinie n'a été rencontrée) vient confirmer ce que le Dr. Jeannel a écrit à propos des Trechinæ rapportés de la même région par le Dr. Hugh Scott (Rev. française d'Ent. ii. p. 205, Janv. 1936) et ce que j'avais indiqué moi-même dans mon étude des Carabiques alpins de l'Afrique orientale (Ann. Soc. ent. France, 1917, pp. 77, 78) : l'intérêt considérable que présentera l'exploration zoologique des hauts sommets éthiopiens lorsqu'on pourra enfin les visiter.

Voici un tableau sommaire des *Calathus* d'Abyssinie * connus actuellement, y compris les cinq espèces nouvelles décrites ci-après.

- | | | |
|--|----|------------------------------------|
| 1. Pronotum subcordiforme, nettement sinué avant les angles postérieurs où les bords sont fortement relevés. Long. 11.5 mm. Pronotum \pm trapézoïdal ou subquadrangulaire, non ou à peine sinué avant les angles postérieurs. Long. maxima 10 mm. | 2. | <i>theodori</i> Ancy \dagger . |
| 2. Angles postérieurs du pronotum très largement arrondis, nullement marqués. | 3. | |
| Angles postérieurs du pronotum \pm marqués, obtus ou droits. | 7. | |
| 3. Pronotum subcarré, peu rétréci en arrière. Pronotum trapézoïdal, nettement rétréci en arrière. Long. 6.5-7 mm. | 4. | <i>trapezicollis</i> , sp. n. |
| 4. Taille moyenne : long 8.5-10 mm. | 5. | |
| Taille inférieure : long 6.5-8 mm. | 6. | |
| 5. Femelle mate, à forte microsculpture. Long. 9-10 mm. | | <i>æthiopicus</i> All. \dagger . |
| Femelle brillante avec la microsculpture du σ d' <i>æthiopicus</i> ; microsculpture du σ moins marquée. Long. 8.5-10 mm. | | <i>æthiops</i> , sp. n. |
| 6. Forme plus large ; élytres plus nettement striés. Long. 7-8 mm. | | <i>montanus</i> , sp. n. |
| Forme plus courtement ovale ; élytres faiblement striés. Long. 6.5 mm. | | <i>ahoanus</i> All. \S . |
| 7. Épaules munies d'un petit denticule saillant. | 8. | |
| Épaules simplement arrondies ou avec un petit tubercule \pm indiqué mais non saillant. | 9. | |

* Cf. Alluaud : Etude des *Calathus* d'Abyssinie, Afra, no. 5, pp. 5, 6, 1932. Le 2^e article des antennes est souvent pubescent sur sa moitié distale, contrairement à ce que j'ai indiqué dans cette Note.

\dagger Ancy, Natur. sicil. ii. 1882-1883, p. 70 ; Alluaud, Bull. Soc. ent. France, p. 176, 1925 ; id., Afra, no. 5, pp. 6, 8, 1932.

\S Alluaud, Bull. Mus. Hist. nat. p. 495, 1918 ; id., Voy. Rothsch. Ethiopie et Afr. Or., Articulés ii. p. 506, pl. Ic 40, f. 2, 1922 ; id., Afra, no. 5, p. 6, 1932.

\S Alluaud, Afra, no. 5, pp. 6, 7, 1932,

8. Pronotum très transversal, plus large à la base qu'en avant, avec les angles postérieurs légèrement obtus, arrondis à la pointe. Elytres ovalaires, faiblement striés. Long. 8-9 mm. *vagestriatus* Fairm.*.
 Pronotum de même largeur en avant et en arrière, avec les angles postérieurs presque droits, à peine obtus, et seulement un peu arrondis au sommet. Elytres légèrement ovoïdes avec les stries mieux marquées. Long. 7-2 mm. *oreobius*, sp. n.
9. Forme large, obèse. Pronotum très transversal, avec les angles postérieurs droits et pointus. Long. 8-9 mm. *orthomoides* All.†.
 Forme normale. Pronotum \pm transversal, avec les angles postérieurs obtus à sommet arrondi 10.
10. Pronotum subquadrangulaire, assez transversal, avec les côtés peu convexement arrondis et les angles postérieurs peu arrondis. Long. 9-5-10 mm. *scotti*, sp. n.
 Pronotum bien plus étroit, peu transversal, avec les côtés plus convexement arrondis et les angles postérieurs plus arrondis. Long. 7-5 mm. *parvicollis* Fairm.‡.

Calathus æthiops, sp. n.

Long. 8-5-10 mm.

Très voisin de *C. æthiopicus* All. mais avec la ♀ brillante et la microsculpture du ♂ plus faible. La ♀ a la microsculpture un peu plus forte que celle du ♂, mais reste brillante.

Loc. Abyssinie : Mt. Zukwala, dans le cratère, 9000 pieds environ, et sur le sommet actuel, 9665 pieds, x. 1926 (*Scott et Omer-Cooper*) ; une série d'exemplaires, dont la plupart battus des arbres, des arbustes, et des feuilles mortes de *Kniphofia*.

Il est à noter que le *C. æthiopicus*, décrit du même Mt. Zukwala, n'a pas été retrouvé.

Calathus scotti, sp. n.

Long. 9-5-10 mm.

Voisin de *C. æthiopicus* All. mais bien distinct par les caractères suivants : ♀ brillante ; tête et pronotum plus larges ; ce dernier subcarré, légèrement trapézoïforme, avec

* Fairmaire, Le Naturaliste, p. 191, 1882 ; id., Ann. Soc. ent. France, p. 90, 1883 ; Alluaud, Afra, no. 5, pp. 6, 7, 1932.

† Alluaud, Afra, no. 5, pp. 6, 8, 1932.

‡ Fairmaire, Le naturaliste, p. 191, 1882 ; id., Ann. Soc. ent. France, p. 90, 1883 ; Alluaud, Voy. Rothschild. Ethiopie et Afr. Or., Articulés ii. p. 507, 1922 ; id., Afra, no. 5, p. 7, 1932.

Fig. 1.

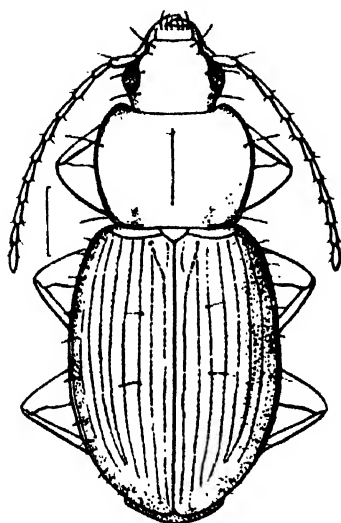


Fig. 2.

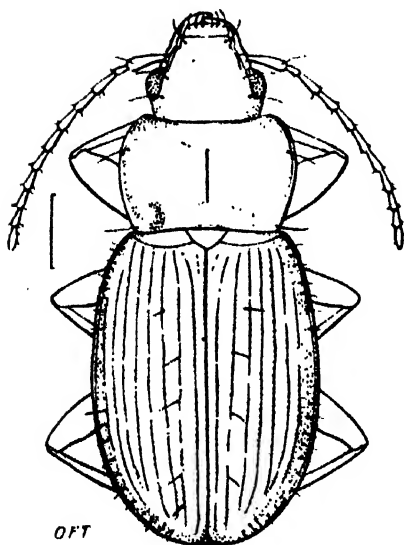


Fig. 1.—*Calathus æthiops*, sp. n., ♂.
Fig. 2.—*Calathus scotti*, sp. n., ♂.

les angles antérieurs moins arrondis, les postérieurs obtus et bien moins largement arrondis; les antennes plus courtes (articles plus épais et un peu moins allongés); élytres \pm déprimés de chaque côté de la suture, plus superficiellement striés; le 3^e intervalle avec 3 à 6 points irrégulièrement placés et généralement d'une façon différente sur chaque élytre; ces points moins marqués chez la ♀. Microsculpture des intervalles plus visible, un peu plus forte chez la ♀, qui cependant reste brillante. Tarses antérieurs ♂ avec les trois premiers articles bien plus élargis.

Comparé à *C. æthiops* All., *C. scotti* a la tête et le pronotum moins larges, les antennes un peu plus épaisses, la microsculpture plus forte, l'arrière corps moins ovale, à côtés plus subparallèles.

Loc. Abyssinie: Mt. Chillalo *, sommet, 12,000–13,000 pieds, "under stones or moss beneath alpine plants," 18. xi. 1926, 6 ♂, 2 ♀ (*Scott*).

Calathus montanus, sp. n.

Long. 7–8 mm.

Comparé à *C. æthiops* (dont il n'est peut-être qu'une race d'altitude) il est en général plus petit, plus étroit, avec les élytres plus parallèles, surtout chez le ♂; les stries bien mieux marquées, les angles antérieurs du pronotum bien moins arrondis et les postérieurs plus marqués, moins largement arrondis. Le disque du pronotum est légèrement trapézoïdiforme; la microsculpture des intervalles est plus fine, un peu plus visible chez la ♀, qui cependant reste brillante.

Loc. Abyssinie: Mt. Chillalo, "moorland, 10,000 ft., under burnt logs of giant heath (*Erica arborea*), 17–19. xi. 1926," une nombreuse série d'individus (*Scott*).

Calathus oreobius, sp. n.

Long. 7.2 mm.

Voisin de *C. vagestriatus* Fairm., mais avec le pronotum moins large, subcarré, légèrement sinué avant les angles postérieurs, qui sont presque droits (légèrement obtus).

* Le Mt. Chillalo est situé à environ 80 milles au S.E. d'Addis Ababa, et environ 20 milles à l'E. du lac Zwaï, par 7° 55' lat. N., donc un peu plus au S. de la limite que j'ai indiquée dans *Afra.* no. 5, p. 5.

Fig. 3.

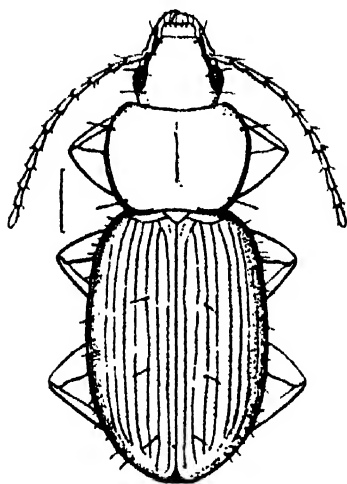


Fig. 4.

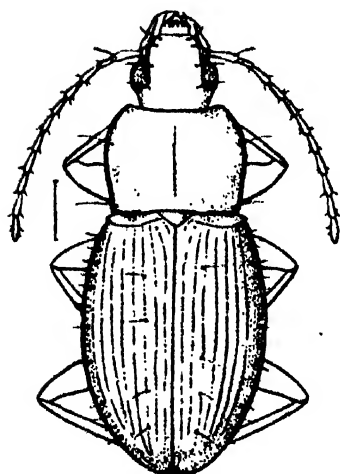


Fig. 3.—*Calathus montanus*, sp. n., ♂.
Fig. 4.—*Calathus oreobius*, sp. n., ♂.

Le repli basilaire des élytres forme une petite dent à l'épaule comme chez *C. vagestriatus*.

Chez la ♀, qui est brillante, les stries sont plus nettes que chez le ♂ et la microsculpture des intervalles est plus visible ; les élytres sont légèrement élargis vers l'arrière.

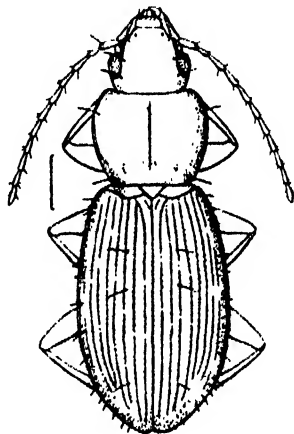
Loc. Mt. Chillálo, "moorland above 12,000 ft., 18 and 21. xi. 1926, under stones beneath alpine plants, or from damp moss," 1 ♂, 1 ♀ (*Scott*).

Calathus trapezicollis, sp. n.

Long. 6.5-7 mm.

♀ mate, avec très grosse microsculpture des intervalles élytraux, visible même dès la base du pronotum, dont

Fig. 5.



Calathus trapezicollis, sp. n., ♀.

les angles postérieurs sont largement arrondis. Voisin de *C. parvicollis* Fairm., mais ce dernier est bien distinct par sa ♀ brillante à faible microsculpture des intervalles élytraux et les stries mieux marquées ; le pronotum est aussi trapézoïforme, mais un peu plus allongé.

Loc. Mt. Chillálo, 9000 ft., "forest, by sifting humus under trees and from under bark," 12-13. xi. 1926, quelques ex. ♂ et ♀ (*Scott*).

NOTE.—Un exemplaire ♂, de la Forêt Djem-Djem, vers 9000 pieds, 1. x. 1926 (*Scott*), est probablement une variété de cette espèce.

Megalonychus acanthurus Gestro.

Loc. Abyssinie : aux bords des ruisseaux au sud-ouest et à l'ouest du Mt. Zukwala, 6000 pieds environ, x.-xi. 1926, plusieurs exemplaires (*Omer-Cooper*) ; Doukam, x. 1926, 7000 pieds, 1 ex. (*Scott*) ; vallée du Muger, 5500 pieds, xii. 1926, sous les pierres dans le lit sec de la rivière, 1 ex. (*Scott*). Espèce connue seulement d'Abyssinie (Shoa, etc.).

Megalonychus luctuosus Reiche.

Loc. Abyssinie : entre les lacs Hora Abjata et Hora Shala, 5000 pieds environ, xi. 1926, 1 ex. (*Omer-Cooper*). Espèce connue seulement d'Abyssinie (Shoa, etc.).

Panagæini.*Microcosmus chaudoiri* (Raffray).

Loc. Abyssinie : S.-E. du lac Zwai, 5500 pieds environ, xi. 1926, 1 ex. (*Omer-Cooper*). Espèce répandue (selon Raffray) dans les hauts plateaux du Hamacen, du Lasta, etc.

Licininæ.*Zargochilus scotti*, sp. n.

Long. 6 mm.

Voisin de *Z. bedeli* All. (Ann. Soc. ent. France, 1908, pp. 25, 26, fig.) de la zone alpine du Kilimandjaro (3200 m.). Le labre est un peu moins longuement bilobé ; le pronotum a la même forme mais avec les angles postérieurs plus largement et plus régulièrement arrondis ; les élytres sont un peu moins profondément striés et les intervalles ne présentent pas de microsculpture visible au grossissement de 65 (microsculpture très fine, mais perceptible chez *bedeli*) ; le premier intervalle n'est pas teinté de roux ; la microsculpture de la tête est plus fine.

Les antennes (brisées chez mes deux types de *Z. bedeli* et que je n'avais pas pu décrire complètement) sont déliées et atteignent au moins le tiers basilaire de l'élytre, le 1^{er} article = 2+3 ; le 2^{ème} est très court ; les trois premiers articles sont glabres ; caractères antennaires qui rapprochent les *Zargochilus* des *Zargus* plutôt que des *Badiæter*.

Loc. Abyssinie : Mt. Chillalo, "moorland, 10,000 ft., 17-19. xi. 1926, under burnt logs of giant heath." Un seul individu (*Scott*).

C'est une des découvertes les plus intéressantes du Dr. Scott. Le genre n'était connu que du Kilimandjaro, d'où j'en ai décrit deux espèces : *bedeli* (*loc. cit.*) et *sjöstedti*, Ark. Zool. xviii. A, no. 33, p. 5, Stockholm, 1927.

RECTIF. Un regrettable lapsus m'a fait écrire au début de la description de *Z. bedeli* (*loc. cit.* p. 25) : " Epistome bilobé "—il faut lire " labre bilobé " ainsi d'ailleurs que c'est bien indiqué sur la figure et à la première ligne de la p. 26.

Chlænlini.

Epomis circumscriptus (Duft.).

Loc. Abyssinie : aux bords de Hora Harsadi (lacs d'Addas). 7000 pieds, 3. xii. 1926, 1 ex. (Omer-Cooper). Espèce répandue dans la région méditerranéenne et dans presque toute l'Afrique.

Chlænius scotti, sp. n.

Long. 10 mm.

Tête et pronotum vert métallique très brillant ; élytres pourpres avec la marge et les épipleures d'un noir verdâtre. Palpes, labre, deux premiers articles des antennes et base du 3^e, et pattes, testacé-rougeâtre. Tête avec le front lisse et quelques points rares et espacés sur le cou ; palpes avec le dernier article longuement fusiforme (♂) ; antennes atteignant au moins le quart basilaire de l'élytre. *Pronotum* aussi long que large, légèrement atténué et sinué avant la base, foncièrement lisse avec quelques points très espacés ; angles antérieurs complètement arrondis ; angles postérieurs légèrement obtus, émoussés au sommet ; fossettes basilaires nettes et profondes ; gouttière latérale très étroite. *Elytres* en ovale régulier, profondément striés, stries éparsément ponctuées le long des intervalles qui sont convexes, sans ponctuation mais couverts d'une microsculpture fine en éléments arrondis. *Dessous* des trois segments thoraciques d'un noir verdâtre ; côtés du prosternum grossièrement et densément ponctués ; côtés du mesosternum lisses et brillants ; episternes metathoraciques un peu plus longs que larges et finement ponctués.

Très voisin de *C. angustatus* Dej., mais bien distinct par ses élytres à marges et épipleures de couleur sombre, le disque étant teinté de pourpre ; les antennes enfumées

à partir du 3^e article qui est sur les trois quarts de sa longueur plus foncé que les suivants ; le cou bien moins grossièrement ponctué.

Loc. Abyssinie : Forêt Djem-Djem, 8000 pieds, dans le lit de la rivière, 2. x. 1926, 2 ♂ (*Scott*).

Chlænius amauropterus Chaudoir.

Loc. Abyssinie : aux bords de Hora Harsadi (lacs d'Addas), 7000 pieds, 3. xii. 1926, 1 ♀ (*Omer-Cooper*) ; vallée du Muger, 5500 pieds, 28-29. xii. 1926, sous les pierres dans le lit de la rivière, 84 ♂, 107 ♀, la plupart ramassés par des indigènes (*Scott*). Espèce répandue dans la Nubie, l'Abyssinie, le pays Somali, etc.

Chlænius denticulatus Dejean.

Loc. Abyssinie : aux bords d'une rivière au sud-ouest du Mt. Zukwala, 6000 pieds, 31. x. 1926, 3 ♂ (*Omer-Cooper*) ; entre le lac Zwai et la rivière Makki, environ 5500 pieds, 23. xi. 1926, 1 ♀ (*Omer-Cooper*) ; vallée du Muger, sous les pierres dans le lit de la rivière, 68 ♂, 84 ♀, pris en même temps avec les nombreux exemplaires de l'espèce précédente (*Scott*). Espèce connue de diverses parties de l'Afrique tropicale.

Chlænius conformis Dejean.

Loc. Abyssinie : au sud-est du lac Zwai, 5500 pieds, xi. 1926, 1 ♂ (*Omer-Cooper*) ; vallée du Muger, 5500 pieds, 28-29. xii. 1926, 1 ♂ (*Scott*). Afrique tropicale et du Sud.

Chlænius cupreocinctus Reiche.

Loc. Abyssinie : aux bords de Hora Harsadi (lacs d'Addas), 7000 pieds, 3. xii. 1926, 1 ♀ (*Omer-Cooper*). Espèce originairement découverte en Abyssinie, signalée après de Rhodésie, d'Uganda (Brit. Mus.), etc.

Chlænius episcopalis Dejean.

Loc. Abyssinie : Forêt Djem-Djem, 8000 pieds, 25. ix. 1926, 1 ♂ (*Scott*). Espèce signalée de la Nubie et de l'Abyssinie.

Chlænius fasciger Chaudoir.

Loc. Abyssinie : Dire Dawa, 1 ♂, 1 ♀ (*Uhlenhuth*). Espèce signalée de Sud-Rhodésie, Natal, etc. ; le British Museum a des spécimens aussi de Nyasaland, d'Uganda, et de Somaliland.

Chlænius latipennis Sternberg.

Loc. Abyssinie : entre la Forêt Djem-Djem et Addis Ababa, entre 7000 et 8000 pieds, 11-14. x. 1926, 1 ♀ (*Scott*). Espèce découverte originairement en Abyssinie (Gara Mulata et Haramaiya, près de Harar; Addis Ababa (*Zaphiro*)), trouvée subséquemment dans le Kilimandjaro; le British Museum possède plusieurs spécimens du Nord-Rhodésie et de Kenya.

Chlænius seminitidus Chaudoir.

Loc. Abyssinie : vallée du Muger, 5500 pieds, 28-29. xii. 1926, 1 ♂ (*Scott*). Cette forme * est connue d'Egypte, de la Nubie et d'Abyssinie.

Chlænius sulcipennis Dejean.

Loc. Abyssinie : entre le lac Zwai et la rivière Makki, 5500-6000 pieds, 23. xi. 1926, 1 ♀ (*Omer-Cooper*). Espèce répandue dans une grande partie de l'Afrique (surtout du côté oriental) d'Egypte jusqu'au Cap.

Oodini.*Oodes (Lonchosternus) angolensis* Er.

Loc. Abyssinie : Forêt Djem-Djem, 8000 pieds, dans le lit de la rivière, 2. x. 1926, 1 ex. (*Scott*). Espèce signalée d'Angola, de l'Abyssinie, et du sud-est de l'Afrique.

Oodes (Lonchosternus) politus Gory.

Loc. Abyssinie : rivière Kattere (à l'est du lac Zwai), 6000 pieds environ, 5. xi. 1926, 2 ex. (*Omer-Cooper*); vallée du Muger, 5500 pieds, 28. xii. 1926, 4 ex. (*Scott*). Signalé de l'Afrique occidentale (Guinée), de l'Abyssinie, et de l'Afrique orientale.

Harpalini.*Harpalus agnatus* Reiche.

Loc. Abyssinie : entre la rivière Hawash et les lacs d'Addas, 6000-7000 pieds, xi. 1926, 1 ex. (*Omer-Cooper*). Signalé seulement d'Abyssinie.

Harpalus impressus Roth.

Loc. Abyssinie : entre Djem-Djem et Wouramboulchi (au delà de la Forêt Djem-Djem), 8000-9000 pieds, x. 1926,

* Placé dans le *Coleopterorum Catalogus*, Pars 115 (*Harpalus* V.), p. 994, 1931, comme une variété de *C. canariensis* Dej.

5 ex. (*Omer-Cooper*) ; terrain cultivé, près d'Addis Alam, 8000 pieds, ix. 1926, 1 ex. (*Scott*) ; Mt. Zukwala, 9000 pieds, x. 1926, 1 ex. (*Scott*). Signalé seulement d'Abyssinie.

NOTE : il faut laisser sans détermination précise les espèces suivantes :—*Harpalus* sp., de Mt. Chillalo, 10,000 pieds, 1 ♂ et 1 ♀, trouvés sous les troncs brûlés d'*Erica arborea*, xi. 1926 (*Scott*) ; et une espèce d'un genre non-déterminé, dont deux spécimens ont été pris entre Addis Alam et la Forêt Djem-Djem, 7000–8000 pieds, ix. 1926 (*Scott*).

*Hyparpalus * difficilis* Pér.

Loc. Abyssinie : Forêt Djem-Djem, 8000 pieds environ, ix. 1926, 1 ex. (*Scott*). Déterminé par E. B. Britton par comparaison avec des exemplaires de cette espèce sud-africaine.

Hyparpalus melancholicus Boh.

Loc. Abyssinie : Dire Dawa, 4500 pieds environ, 1 ex. (*Uhlenhuth*). Déterminé par E. B. Britton. Espèce signalée de l'Afrique du Sud.

Hyparpalus tomentosus Dej., var.

Loc. Abyssinie : vallée du Muger, 5500 pieds, xii. 1926, 1 ♂, 3 ♀ (*Scott*). Espèce largement répandue dans l'Afrique tropicale.

Anisodactylus australis Pér.

Loc. Abyssinie : Dire Dawa, 3 ♂, 2 ♀ (*Uhlenhuth*). Spécimens déterminés par E. B. Britton. Espèce signalée du Zambèze, de Mozambique, de S.W. Africa, etc.

Anisodactylus ochropus Dej. (?).

Loc. Abyssinie : " Came to light at Hawash railway station, circa 3500 ft., 2. ix. 1926, 1 ♂ " (*Omer-Cooper*). Espèce décrite du Sénégal.

Crasodactylus punctatus Guér.

Loc. Pays Somali Français : Djibouti, 28. viii. 1926, " came to light at Hôtel Continental," 1 ex. (*Omer-Cooper*). Abyssinie : vallée du Muger, 5500 pieds, xii. 1926, 1 ex. (*Scott*). Découverte en Abyssinie, cette espèce a été signalée subséquemment de l'Afrique orientale,

* *Hyparpalus* Alluaud, nom. nov. pour *Hypolithus* Dejean, nom préoccupé : voir Bull. Soc. ent. France, p. 162, 1930.

d'Arabie, de Tunisie, etc. ; Inde, Punjab (une série de spécimens, déterminés par H. E. Andrewes, dans le British Museum).

Platymetopus vestitus Dej.

Loc. Abyssinie : Forêt Djem-Djem, 8000-9000 pieds, et Wouramboulchi, au delà de Djem-Djem, vers 9000 pieds, ix.-x. 1926, 5 ex. (*Omer-Cooper, Scott*). Espèce décrite du Sénégal.

Egadroma sp., prope *marginata* Dej.

Loc. Abyssinie : aux bords d'une rivière, au sud-ouest du Mt. Zukwala, 6000 pieds environ, 31. x. 1926, 1 ex. (*Omer-Cooper*).

(*E. marginata* est répandue dans l'Europe centrale, l'Asie centrale, la région méditerranéenne, etc.)

Ooidius sellatus Dej. (?).

Loc. Abyssinie : Dire Dawa, 4500 pieds environ, 7 ex. (*Uhlenhuth*). Cette espèce a été signalée du Sénégal et du Soudan Français.

Anaulacini.

Æphnidiu madagascariensis Chaudoir.

Loc. Abyssinie : aux bords de Hora Harsadi (lacs d'Addas), 7000 pieds, 4. xii. 1926, 1 ex. (*Scott*). Madagascar, et largement répandu en Afrique.

Leblini.

Metabletus sp., prope *fraterculus* Chaud.

Loc. Abyssinie : Mt. Chillalo, en forêt à 8500 pieds, 24 xi. 1926, 1 ex. (*Scott*). Ce spécimen est très près de *M. fraterculus*, espèce décrite d'Abyssinie.

Pœcilothis [*Astata*] *deplanata* Gerst.

Loc. Abyssinie : terrain cultivé près d'Addis Alam, 8000 pieds environ, 18. ix. 1926, 1 ex. (*Scott*). Espèce décrite de Zanzibar.

Glycia rufolimbata Maindron.

Loc. Pays Somali Français : Djibouti, "came to light at Hôtel Continental, 29-31. viii. 1926," 1 ex. (*Omer-Cooper*). Signalée de la Nubie, de l'Abyssinie, Somaliland, l'Arabie, la Syrie, etc.

Dryptini.*Drypta distincta* Rossi, var. *dorsalis* Dej.

Loc. Abyssinie : aux bords de la rivière Hawash, près de Jillî, 5500 pieds environ, 1. xii. 1926, 1 ex. (*Scott*). L'espèce est largement répandue dans l'Europe méridionale, l'Asie Mineure et l'Afrique ; la variété a été décrite du Sénégal.

Brachynini.

Brachynus scotti Liebke, Die Brachyninæ der Afrikanischen Festlandes, Mém. Soc. ent. Belg. xxiv. p. 36, 1934.

Loc. Abyssinie : vallée du Muger, 5500 pieds, xii. 1926, 2 ex. (*Scott*).

Espèce très près de l'espèce sud-africaine, *B. subcostatus* Dej.

Brachynus armiger Dej., subsp. *costiger* Chaud.

Brachynus armiger costiger Liebke, op. cit. pp. 11, 44, 45 (fig. 40).

Loc. Abyssinie : vallée du Muger, 5500 pieds, xii. 1926, 3 ex. (*Scott*). *B. armiger* est connu de l'Afrique du Sud, la forme *costiger* de l'Abyssinie seulement.

Brachynus connectus Dej., subsp. *distinctus* Pér.

Brachynus connectus distinctus Liebke, op. cit. pp. 7, 21, 25 (fig. 3).

Loc. Abyssinie : Doukam, entre 6000 et 7000 pieds, 20. x. 1926, 1 ex. (*Scott*). *B. connectus* est connu du Sénégal, de la Nubie, de l'Abyssinie et de l'Afrique orientale ; la forme *distinctus* de Mozambique.

Pheropsophus africanus Dej.

Loc. Abyssinie : vallée du Muger, 5500 pieds, xii. 1926, 1 ex. (*Scott*) ; det. E. B. Britton. Signalé du Nord-Africain et de l'Abyssinie.

Pheropsophus sp.

Il faut laisser sans détermination précise sept exemplaires d'une espèce * à élytres immaculés, noirâtres, trouvés sur les bords de Hora Harsadi, un des lacs d'Addas, à 7000 pieds, 3. xii. 1926 (*Omer-Cooper*).

Zuphiini.

Zuphium sp.

Loc. Abyssinie : au sud-est du lac Zwai, 5500 pieds environ, xi. 1926, 1 ex. (*Omer-Cooper*).

* [Not represented in the British Museum.—H. S.]

[SUPPLEMENT.

Cicindelidæ. By HUGH SCOTT.

Cicindelidæ were only met with in Abyssinia proper on two occasions, both in the dry season, and at places not much more than 5000 feet above sea-level. The three forms found were, however, present in large numbers. The first is a species known from Abyssinia and adjacent countries, the other two are localized subspecific forms of species widely distributed in Africa. A fourth form included in this paper was taken on the sea-shore at Djibouti, and is a localized subspecies of a Red-Sea coastal and Mediterranean species. I am indebted to Dr. Walther Horn for the determinations.

Cicindela alboguttata Klug.

Loc. Abyssinia: Muger valley, 5500 feet, 28-29. xii. 1926, 56 specimens (*Scott*). Recorded from Eritrea, Abyssinia, Italian Somaliland, and S.W. Arabia (Lahej); the British Museum has specimens from Jebel Murra in Western Darfur.

Cicindela dongalensis Klug, subsp. *abyssinica* W. Horn.

Loc. Abyssinia: Muger valley, taken at the same place and time as the preceding, 28 specimens (*Scott*). The species as a whole is widely distributed in tropical Africa, both west and east; the form *abyssinica* is known from Eritrea and Abyssinia.

Cicindela brevicollis Wied., subsp. *boreo-dilatata* W. Horn, Ent. Nachrichtenblatt, iii. p. 8, 1929.

Loc. Abyssinia: near lake Hora Abjata, a little over 5000 feet, 17 and 22. xi. 1926, 18 specimens (*Omer-Cooper*). The subspecies was based on material from southern Abyssinia (Lake Ganjule or Chamo, etc.) and Kenya (Lumbwa district); various forms of the species are distributed over large parts of tropical and South Africa.

Cicindela litorea Forsk., subsp. *alboreducta* W. Horn, Vereinsschrift Ges. Luxemburg. Naturfreunde, p. 73, 1934.

Loc. French Somaliland: Djibouti, from the sea-shore, xii. 1926, 1 ♂, 1 ♀ (*Omer-Cooper*); also Obock. The species as a whole is widely spread in the Mediterranean region, Egypt, on the Red Sea coasts, etc.]

XXII.—*New African Lavinæ (Coleoptera, Dryopidæ).*
By H. E. HINTON (Zoological Laboratory, Cambridge).

THIS paper is one result of a study of a number of African Lavinæ which were sent to me for determination by Sir Guy Marshall and Dr. R. Jeannel. One genus is relegated to synonymy and five new species are described.

My best thanks are due to Dr. A. D. Imms for many helpful suggestions during the course of this work, and to Dr. H. Scott for the loan of several specimens from the collection of the British Museum. Illustrations of the genitalia were drawn with the aid of a camera lucida, and those of the elytral apices with a squared eye-piece micrometer. Lines next to figures refer to a length of 0.20 mm.

POTAMODYTES Grouvelle.

Potamodytes Grouvelle, Bull. Soc. ent. France, p. 78 (1896); id., Ann. Soc. ent. France, lxxv. p. 146 (1906).

This genus was erected for a number of African and Madagascan species. The only characters used by Grouvelle to separate *Potamodytes* from other genera of Potamophilinæ were the structure of the prosternum and the mesosternum and the relative lengths of the abdominal segments. The prosternum differs from that of all other genera in its relatively short and broad form and very broadly truncate, or at most feebly rounded, apex (fig. 1). The mesosternum is unique in the subfamily in that it has no channel or other cavity for the reception of the prosternal process (fig. 2). The relative lengths of the abdominal segments do not constitute a character of any importance in separating this from other genera, and, in point of fact, the proportions are similar to those of most other genera in the subfamily. Two characters of considerable generic value were not mentioned by Grouvelle. The most important of these is the presence of *two* accessory striæ on each elytron at the base between the sutural and second stria. Other genera have only one accessory stria or none. The second is the transverse impression on about the apical fifth to eighth of the pronotum. This impression is in some species (e. g., *antennatus* Dohrn) complete, while in other

species (e. g., *apicalis* Hinton) it is broadly interrupted at the middle. Also, the structure of the male genitalia is of some generic value, for in all species examined it conformed to a type easily distinguished from that of any other genus of *Lavinæ*.

The species of this genus are particularly difficult to deal with from a systematic point of view. This difficulty results mainly from one cause. It is in most

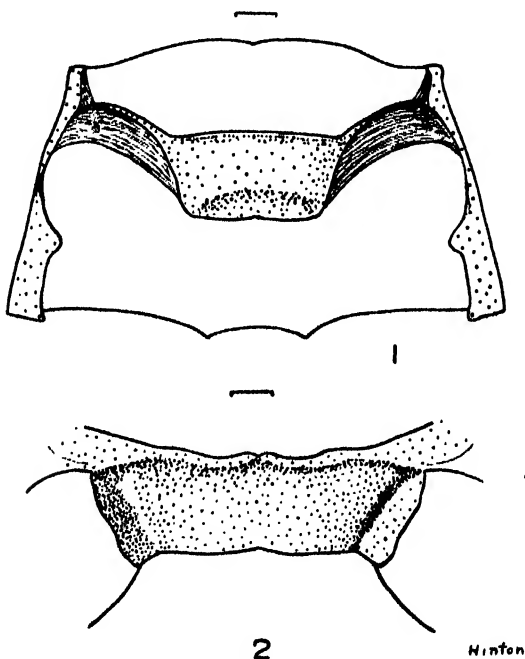


Fig. 1.—Ventral view of the prothorax of *Potamodytes antennatus* Dohrn, to show structure of the prosternum.

Fig. 2.—Ventral view of mesosternum of same.

instances very hard properly to associate females with their males, differences between males and females of one species often appearing to be of a much greater magnitude than differences between males of two species or females of two species. It is very probable that for a great many years to come the biology of most of these tropical forms will not be sufficiently known to associate

correctly males with females. This leaves us with two alternatives: either we describe males and females for the most part independently of each other, or we describe only one sex and wherever possible tentatively associate the other sex. I have chosen the latter alternative as being the one which in the long run offers less chances of confusion and synonymy, and I have chosen to deal with the males, as on the whole they seem to offer better specific characters.

The species of *Potamodytes* are elongate, subparallel, and moderately convex insects, some of them being the largest known Dryopids. Most are greyish to black above and fulvo-cinereous beneath, the dorsal surface and legs often with a greenish iridescence which is subject to much interspecific variation. The most important specific characters seem to be the following:—

- (1) The proportions of the prothorax and elytra.
- (2) The punctuation of the dorsal surface—that of the ventral surface and legs seems, so far as the species known to me are concerned, to offer no specific differences.
- (3) The presence or absence of elevations immediately behind the eye.
- (4) The form of the produced portion of the genæ below the middle of the eyes.
- (5) The outlines of the pronotum—*e. g.*, whether or not the sides are sinuate, shape of the apical angles, etc.
- (6) The form of the elytral apices. This character is particularly important in separating the females.
- (7) Presence or absence of gibbosities on the elytra.
- (8) Structure of the male genitalia. The males often appear to be separable only on the characters found in these structures. The genitalia are very difficult to deal with, for, unlike those of most Dryopids, they exhibit a considerable interspecific variation, and the sutures of the basal piece and basal portions of the parameres, which in other genera often offer such excellent characters, are generally so effaced that careful staining will not reveal them. The variation in the genitalia is due to differences in the degree of sclerotization of the various structures and, so far as the median lobe is concerned, to the extent to which the internal sac is exerted. For example, the median lobes in figs. 3 and 7 are of practically the same form, but in fig. 3 the internal

sac is partly evaginated. On the whole, the form of the parameres seems to be the best single character.

The material available was not ample enough to make a proper search for specific characters in the structure of the last (from fifth onwards) abdominal sternites of males and females and the female genitalia.

Sexual external characters are abundant and striking in this genus. The following have been observed in the species at hand :—

(1) Females generally slightly larger and broader than males.

(2) Genæ with the produced portion (below the middle of the eyes) usually more prominent in males than in females.

(3) Elytral apices of females always differently shaped from those of males.

(4) Elytra of females often with gibbosities which are absent or not so well formed in the males.

(5) Metasternal disc of males concave throughout but convex anteriorly in females.

(6) Median portion of abdominal sternites, particularly basally, strongly concave in males and feebly convex or flat in females.

(7) Apex of fifth and sixth abdominal sternites more narrowly and deeply emarginate in females than in males.

Potamodytes marshalli, sp. n. (Figs. 3-6.)

Male.—Length 4.5 mm. ; breadth 1.82 mm.

Head without distinct impressions on the front ; with the surface smooth behind the eye ; produced portion of genæ prominent ; surface with round, though occasionally irregular, punctures, which are about as coarse (0.012 mm. in diameter) as, or slightly finer than, the facets of the eyes, and are mostly separated by about half their diameters, but often contiguous. *Prothorax* at broadest point, which is at base, broader than long (1.60 mm. : 1.25 mm.), with base broader than apex (1.60 mm. : 1.17 mm.). Anterior margin feebly arcuate, nearly truncate, for its entire breadth ; apical angles inconspicuous, feebly obtuse ; sides moderately feebly narrowed towards apex, feebly arcuate, feebly and shortly sinuate before apical angles and feebly but more broadly sinuate before basal angles, lateral edges narrowly

but distinctly margined; basal angles not produced, nearly rectangular, and reflexed upwards to form angles of about 50° with the pronotal surface; base trisinate, broadly and moderately deeply sinuate on each side, more narrowly and very shallowly sinuate in front of

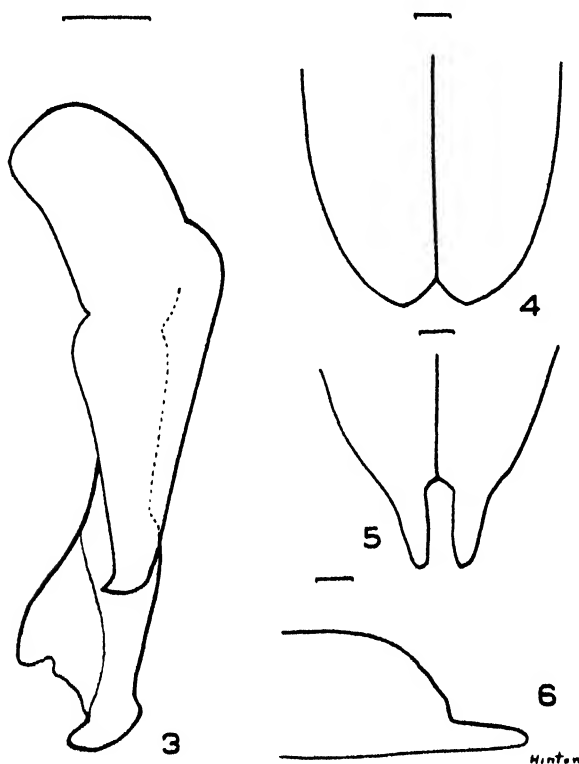


Fig. 3.—Lateral view of male genitalia of *Potamodytes marshalli*, sp. n.

Fig. 4.—Dorsal view of elytral apices of same.

Fig. 5.—Dorsal view of elytral apices of female of same species.

Fig. 6.—Lateral view of apex of left elytron of female of same.

scutellum. Pronotum with the apical transverse impression deep and distinct on sides, but on middle fourth completely absent; from basal sixth to basal half with a median longitudinal impression which is moderately broad, very shallow, and indefinitely bounded; on each side on basal third with a feeble, moderately narrow,

and irregular sulcus; surface with punctures which are about a fourth coarser than those of head, more distinct, and slightly sparser. *Elytra* about three times as long as prothorax (3.87 mm. : 1.25 mm.) and with the broadest point at basal fourth. Apices as shown in fig. 4. Humeri prominently gibbous. Striæ feebly impressed basally, towards apex nearly obliterated; strial punctures from a fourth to a third as coarse as discal intervals. *Genitalia* as shown in fig. 3.

Female.—Head with the produced portion of the genæ not as prominent as that of male. *Elytra* with a longitudinal gibbosity on apical third on third interval; elytral apices as figured (figs. 5 and 6).

Type.—Male in the collection of the British Museum (Natural History). Sierra Leone: Njala, 16. v. 1926, at light (*E. Hargreaves*).

Paratypes.—Two males with same data as above, but one collected 1. vi. 1927 and the other xii. 1934; two females also with same data collected 30. vi. 1927 and 15. v. 1928.

Variations.—The two male paratypes differ from the type in that there is no trace of a basal sublateral sulcus on the pronotum and both have the apical transverse impression visible but broad and very feebly impressed on the middle fourth. One of the females has the apical transverse impression quite distinct at the middle but shallower than at the sides, the head and pronotum moderately densely punctate, the punctures being about two-thirds as coarse as those of the type, and no trace of a sublateral sulcus, while the other has the head and pronotum punctate similarly to the type, the pronotum with a feeble impression in place of the sublateral sulcus of the type, the gibbosity on the third interval much more feeble than that of the other female, and the produced apices of the elytra slightly broader than those of the illustrated specimen.

Comparative Notes.—This is close to no species known to me.

Potamodytes tuberosus, sp. n. (Figs. 7–10.)

Male.—Length 6.4 mm.; breadth 1.90 mm.

Head without distinct impressions on front; surface behind eye smooth; produced portion of genæ very

prominent; surface with round to irregular punctures which are slightly finer than, to about as coarse as, the facets of the eyes (0.013 mm. in diameter) and mostly separated by about half their diameters though often contiguous. *Prothorax* at broadest point, which is at base, broader than long (1.60 mm. : 1.17 mm.), with base broader than apex (1.60 mm. : 1.30 mm.). Anterior margin feebly arcuate, nearly truncate, except on middle sixth, which when seen from above is just barely sinuate; apical angles inconspicuous, feebly obtuse; sides moderately feebly narrowed towards apex, very feebly arcuate, strongly but narrowly sinuate before apical angles and broadly but much more feebly sinuate before basal angles, lateral edges narrowly but distinctly margined; basal angles not produced, nearly rectangular, and reflexed upwards to form an angle of about 50 with the pronotal surface; base trisinate, broadly and moderately deeply sinuate on each side, and shallowly and more narrowly sinuate in front of scutellum. Pronotum with apical transverse impression deep and distinct on sides and on middle very shallow, broad, and indistinct; from basal eighth to basal two-fifths with a very broad, very shallow, indefinitely bounded, median longitudinal impression, and on each side of this impression near the basal margin is a large shallow puncture; pronotum elsewhere without distinct impressions; surface punctate as head but with the punctures slightly larger and sparser. *Elytra* more than three times as long as prothorax (4.7 mm. : 1.17 mm.) and with the broadest point between basal third and basal fourth (*i. e.*, opposite hind coxæ). Apices as shown in fig. 8. Humeri prominently gibbous. Striæ feebly impressed at base, towards sides and apex scarcely noticeable; stria punctures indistinct, a fourth to a third as broad as intervals. *Genitalia* as shown in fig. 7.

Female.—Produced portion of genæ distinctly less prominent than that of male. Each elytron between basal third and fourth on third interval has a long, prominent gibbosity; apices of elytra as shown in figs. 9 and 10.

Type.—Male in the collection of the National Museum of Natural History, Paris. Congo: Ogooué, Sam Kita, 1910 (*R. Ellenberger*).

Paratypes.—Three males and twelve females with same data as type.

Variations.—There is in the series before me but little variation in either males or females. In both sexes the

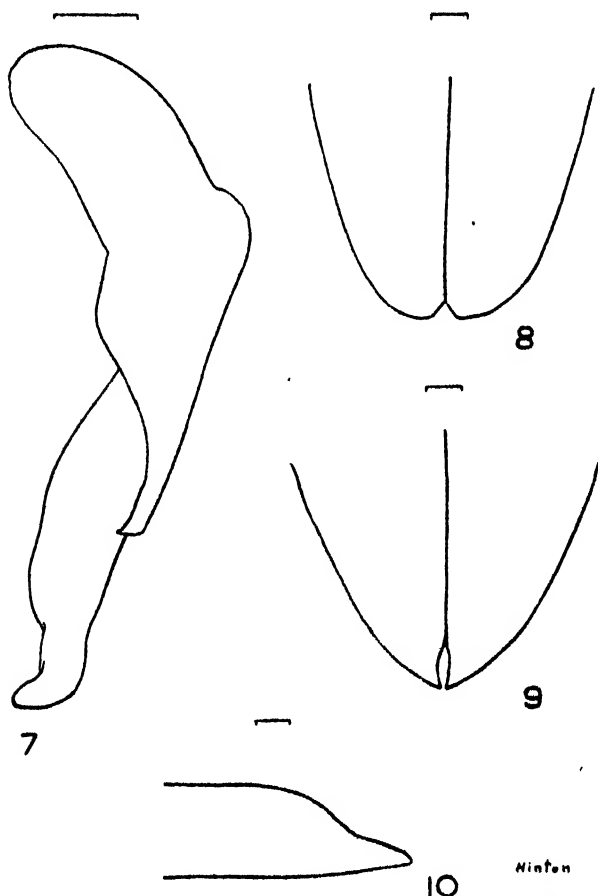


Fig. 7.—Lateral view of male genitalia of *Potamodytes tuberosus*, sp. n.
 Fig. 8.—Dorsal view of elytral apices of same.
 Fig. 9.—Dorsal view of elytral apices of female of same.
 Fig. 10.—Lateral view of left elytron of female of same.

transverse impression on the pronotum is occasionally more feeble on middle than in the type, but it is usually more strongly impressed. Both sexes show a considerable

amount of variation in the greenish colour of the dorsal surface and legs; in some, as in the type, there is practically no green iridescence, while in other specimens it is present over most of the dorsal surface and legs.

Comparative Notes.—In general appearance and in the structure of the male genitalia this species seems to be most closely related to *Potamodytes marshalli*, and the males of the two species can scarcely be separated without recourse to a study of the male genitalia. As pointed out above, the marked differences seen in the median lobes of the two species illustrated (figs. 3 and 7) are of no importance. The parameres of *marshalli* are distinctly broader than those of *tuberosus*, and the basal piece is shorter than that of the latter species. The relative proportions of the prothorax and proportional length of prothorax to elytra are slightly different in the two, but my series is so small that it is not possible to determine whether or not these differences are of any specific value. The females of the two species are also very similar in appearance, but differ strikingly in the form of the elytral apices (cf. figs. 5 and 9, 6 and 10).

Potamodytes angustatus, sp. n. (Figs. 11–14.)

Male—Length 7 mm.; breadth 2.12 mm.

Colour of dorsal surface (cuticle) nearly black. *Head* with the surface of the front without distinct impressions; surface immediately behind eye smooth; produced portion of genæ very prominent; surface punctate with round to occasionally irregular punctures, which are finer (0.010 mm. in diameter) than the facets of the eyes and are separated by a distance less than their own diameters. Prothorax at broadest point, which is at base, broader than long (1.75 mm. : 1.45 mm.), with base broader than apex (1.75 mm. : 1.42 mm.). Apical margin feebly arcuate, nearly truncate, but when viewed from the side it seems to be very feebly and broadly sinuate on the middle and again on each side, behind the eye, before the apical angle; sides moderately narrowed towards apex, feebly arcuate, feebly and narrowly sinuate before apical angles, broadly and very feebly sinuate before basal angles, lateral edges narrowly but rather deeply margined; basal angles nearly rectangular and strongly reflexed upwards to form an angle of 60° to 70°

with the pronotal surface; base trisinate, broadly and deeply sinuate on each side, narrowly and slightly more shallowly sinuate in front of scutellum. Pronotum

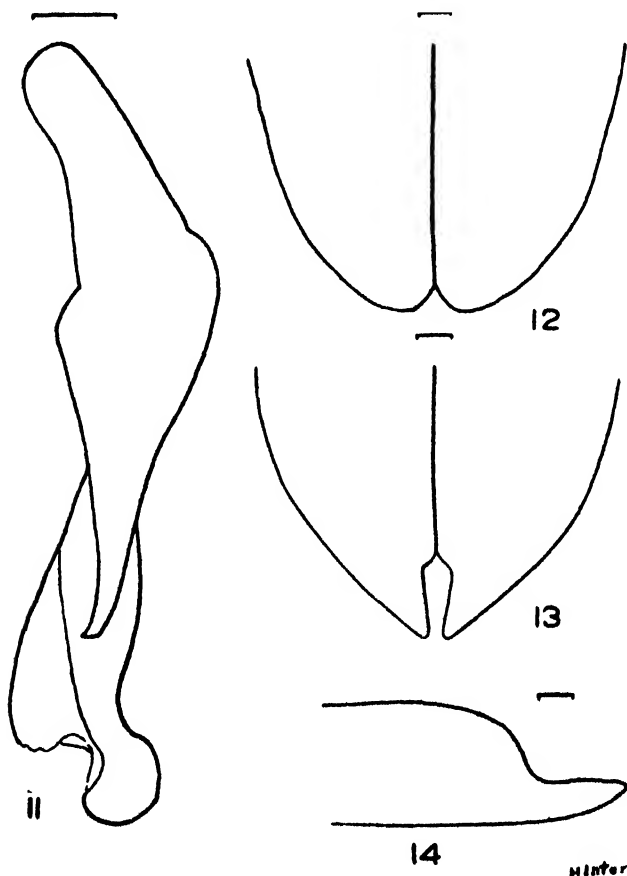


Fig. 11.—Lateral view of genitalia of male of *Potamorytes angustatus*, sp. n.

Fig. 12.—Dorsal view of elytral apices of same.

Fig. 13.—Dorsal view of elytral apices of female of same.

Fig. 14.—Lateral view of left elytron of female of same.

with the transverse impression deep, narrow, and distinct on sides, and on middle sixth it is shallow and broad but nevertheless distinct; when the pronotum is seen

from above a carina-like median longitudinal callus about 0.25 mm. long and about 0.025 mm. broad bisects the apical impression; from other views than dorsal this fine callus is generally not evident; from basal sixth to basal third with a large median impression which is triangular in shape, very shallow, and on each side of its base (which is posterior) with a large shallow puncture; surface with punctures which are mostly from a third coarser than to twice as coarse as those of the head and very slightly sparser. *Elytra* nearly four times as long as prothorax (5.2 mm. : 1.45 mm.) and with the broadest point at the humeri. Apices as shown in fig. 12. Humeri moderately prominently gibbous. Striæ feebly impressed on basal discal region, towards sides and apex still more feebly impressed, and on apical fourth absent; strial punctures of discal region (about 0.04 mm. in diameter) a fourth to a third as broad as intervals. *Genitalia* as shown in fig. 11.

Female.—With produced portion of genæ distinctly less prominent than that of male. Punctures of head and prothorax about a third coarser and distinctly denser than those of the type. Apical transverse impression of the pronotum slightly more strongly impressed than that of the males. Each elytron with a feeble longitudinal gibbosity on third interval at a point opposite hind coxæ; the apices of the elytra differ from those of the males as shown in figs. 13 and 14.

Type.—Male in the collection of the British Museum. Uganda: Jinja, Ripon Falls, 18. v. 1932, on rocks (*E. G. Gibbins*).

Paratypes.—One male and two females with same data as above.

Comparative Notes.—This species is most closely related to *Potamodytes tuberosus* and *P. marshalli*. From the males of both of these species it can be readily separated by the structure of the male genitalia, and from the females of these two it differs in the form of the elytral apices.

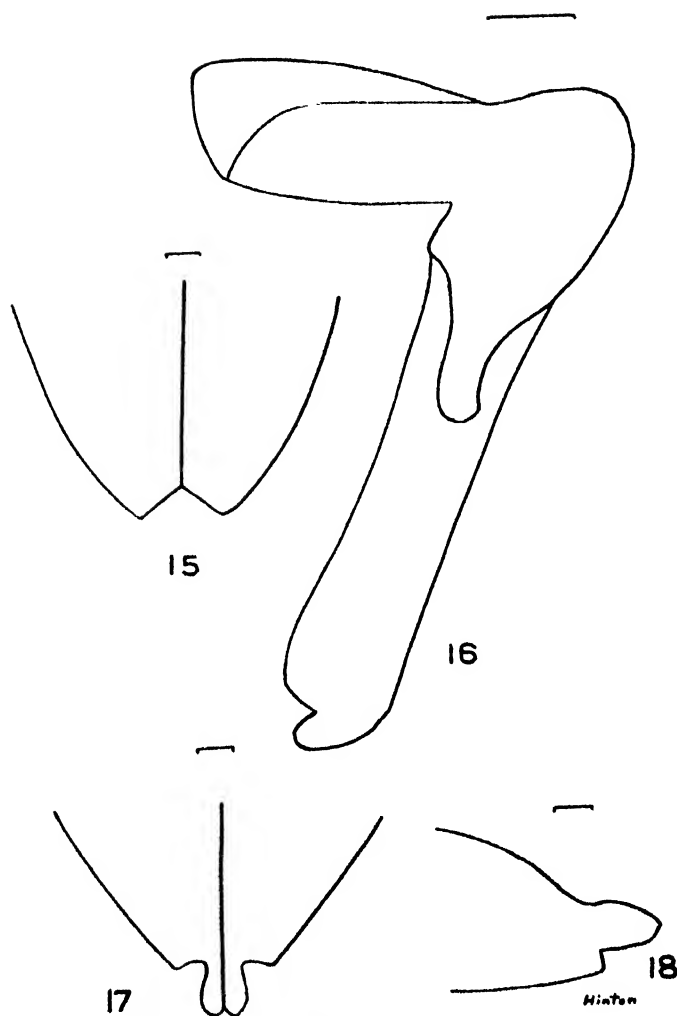
Potamodytes apicalis, sp. n. (Figs. 15–18.)

Male.—Length 7.0 mm.; breadth 2.32 mm.

Head without distinct impressions on the front; surface immediately behind the eye smooth; produced portion

of genæ prominent; surface with round to irregular punctures which are as fine as the facets of the eyes (about 0.035 mm. in diameter) and are occasionally contiguous but are generally separated by about their own diameters. *Prothorax* at broadest point, which is at base, broader than long (2.07 mm. : 1.52 mm.), with base broader than apex (2.07 mm. : 1.40 mm.). Anterior margin when seen from above very feebly arcuate or nearly truncate for its entire breadth; apical angles inconspicuous and feebly obtuse; sides moderately narrowed towards apex, very feebly arcuate, narrowly and moderately deeply sinuate before apical angles and not sinuate before basal angles; lateral edges narrowly but distinctly margined; basal angles feebly acute and reflexed upwards to form an angle of about 30° with the pronotal surface; base trisinate, broadly and deeply sinuate on each side, more narrowly and moderately deeply sinuate in front of scutellum. Pronotum with apical transverse impression, deep and broad on each side but absent on middle half; from about basal sixth to fourth there is a median, very broad, shallow impression; surface with the punctures about a fourth coarser than those of head and similarly distributed. *Elytra* more than three times as long as prothorax (5.2 mm. : 1.52 mm.) and with the broadest point opposite the hind coxæ. Apices as shown in fig. 15. Humeri broadly and moderately strongly gibbous. Striæ feebly impressed on basal discal region, and towards apex and sides becoming more feeble, on apical fourth absent; on the disc the stria punctures are generally about a fifth to a fourth as broad as the intervals. *Genitalia* as shown in fig. 16.

Female.—Head with the genæ not as prominent as in the male; surface immediately behind eye with a transverse gibbosity, which is about 0.25 mm. long and 0.075 mm. broad, and is connected by a fine, low, indistinct ridge with the outer margin of the produced genæ (the presence of this ridge, which is certainly not a sexual character in other species I have examined, leads me to believe that I may be in error in associating the female with the male here described). Measurements of the prothorax are as follows:—length 1.47 mm.; breadth across broadest point, which is at base, 2.25 mm.; breadth at apex 1.162 mm. Apical pronotal impression



- Fig. 15.—Dorsal view of elytral apices of male of *Potumodytes apicalis*,
sp. n.
Fig. 16.—Lateral view of male genitalia of same.
Fig. 17.—Dorsal view of elytral apices of female of same.
Fig. 18.—Lateral view of left elytron of female of same.

deep and narrow on each side and absent only on middle third; basal angles more rounded than in male and more strongly reflexed upwards, so that the angle made with the pronotal surface is about 45° ; surface more densely punctate than that of male. Elytra with a broad moderately convex gibbosity on the basal discal region of each elytron; apices as figured (figs. 17 and 18); stria punctures coarser and denser than those of the male, *e. g.*, those of the basal discal region are a fourth to a third as broad as the intervals; striae slightly more strongly impressed than in male.

Type.—Male in the collection of the British Museum. S. Nigeria: Cross River, Ikom, x. 1916 (A. W. J. Pomeroy).

Paratype.—One female with same data as above.

Comparative Notes.—This is close to no species known to me.

HYDRETHUS Fairm.

1889. *Hydrethus* Fairmaire, Ann. Soc. Ent. Belg. xxxiii., Compt. Rend. p. x0.

1920. *Potamocares* Grouvelle, Voy. Alluaud et Jeannel, Afr. Or., Col. xv. p. 199, t. ix. fig. 6.

I have been able to compare the types of these two genera and can find no generic differences between them. Grouvelle does not even mention *Hydrethus* Fairm. in his description of *Potamocares*.

Hydrethus jeanneli, sp. n. (Figs. 19 & 20.)

Male.—Length 4.0 mm.; breadth 1.62 mm.

Oblong, subparallel, moderately convex. Densely pubescent throughout, with suberect to recumbent hairs. Cuticle feebly shining; black to rufo-piceous, antennae, mouth-parts, legs, and most of ventral surface fulvous to cinereous. *Head* without distinct impressions; eyes rather close but not as close as antennal bases (0.40 mm. : 0.27 mm.); anterior margin of clypeus truncate and with the angle on each side broadly rounded; anterior margin of labrum feebly and shallowly arcuately emarginate at middle, with the angle on each side broadly rounded; surface with a moderately dense, alutaceous micro-sculpture and with round punctures which are about as coarse as the facets of the eyes (0.012 mm. in diameter) and are usually separated by a distance equalling from

a fourth to a half of their diameters. *Prothorax* at broadest point, which is just before basal angles, broader than long (1.27 mm. : 0.87 mm.), with base broader than apex (1.25 mm. : 0.90 mm.). Outline as figured (fig. 19); lateral margins reflexed upwards from basal to apical angles. Pronotal surface evenly and moderately

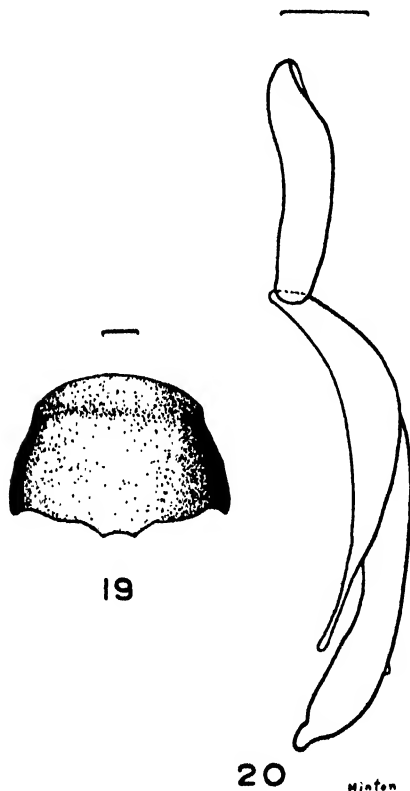


Fig. 19.—Dorsal view of prothorax of *Hydrethus jeanneli*, sp. n.

Fig. 20.—Lateral view of male genitalia of same.

convex; punctate as head, but in parts slightly more sparsely so. *Elytra* more than three times as long as prothorax (3.0 mm. : 0.87 mm.) and with the broadest point at apical third. Humeri broadly and moderately strongly gibbous; elytral apices evenly rounded, without spines; striæ well impressed; stria punctures round

to subquadrate, moderately deep, and on discal region of basal third one-half to two-thirds as broad as intervals, and separated longitudinally by a distance equalling from one-half to two-thirds of their diameters; sutural interval feebly convex from basal fourth to apex; surface of intervals with a fine, dense, punctate microsculpture and without other larger punctures. Apex of last abdominal sternite deeply and moderately narrowly emarginate. *Genitalia* as figured (fig. 20).

Type.—Male in the collection of the National Museum of Natural History, Paris. Mozambique: Valle du Reveue, near D'Andrada, 1905 (*G. Vasse*).

Comparative Notes.—This is close to *Hydrethus striatus* (Grouv.) but may be separated by the structure of the male genitalia. The paramere of *striatus* when seen in lateral view is much broader, and the apex is not long, slender, and parallel-sided. The length ratio of the parameres to the basal piece is in the order of 58:59 in *striatus*, whereas in *jeanneli* the ratio is in the order of 71:48.

XXIII.—*Note on the Identity of the Cape "White-fish,"*
Barbus capensis. By K. H. BARNARD, South African
Museum.

IN the descriptions of *Barbus capensis* and *B. burchelli* Dr. Andrew Smith (Illustr. Zool. S. Afr. Pisces, 1849) mentioned that the scales in the former species were marked with *longitudinal* striæ and in the latter species with *radiating* striæ. This difference in scale sculpturing is the basis of Boulenger's division of the very numerous species of the genus *Barbus* (Cat. F.-W. Fishes Africa, vol. ii. p. 2, fig. 1 (1911)).

Boulenger, however, with Smith's type-specimen of *capensis* at hand, placed *capensis* in his second division, i. e., among the species with radiately striate scales (l. c. p. 123). Except for the discrepancy between Smith's and Boulenger's descriptions, there has been no real cause to suspect a fundamental error until recently, when material has been received at the S.A. Museum which seemed to show that a species with longitudinally striate scales was confined to the Olifants River (Clanwilliam

Division, Cape Province), while another species with radiately striate scales was found in the Berg River and other rivers in the S.W. Cape (but not in the Olifants River). Andrew Smith said that *capensis* occurred in the Breede and the Olifants Rivers. The possibility of some mistake at once became apparent, and at my request Mr. J. R. Norman, of the British Museum, has very kindly investigated the matter.

Mr. Norman finds that the type-specimen of *capensis* ex coll. Sir A. Smith (Boulenger, *l. c.*, specimen no. 1) has, in fact, longitudinally striate scales, whereas all the other specimens assigned by Boulenger to *capensis* have radiately striate scales. As Smith's description and his accepted type agree in this essential feature, it is clear that *capensis* must be grouped in Boulenger's first division. Smith described the species from a specimen which certainly came from the Olifants River, and apparently did not subject any specimens from the Breede River to the same careful scrutiny.

In 1913 Gilchrist and Thompson (Ann. S. Afr. Mus. xi. p. 398) described *Barbus seeberi*, a species with longitudinally striate scales, also from the Olifants River, Cape. A series of specimens from this same river has recently been received at the S.A. Museum, measuring up to 26 inches in length. They are obviously referable to *seeberi*, and also, in view of Mr. Norman's confirmation of the scale-character, to *capensis*.

The following recorded specimens are therefore referred to *capensis* :—

- a. Type of *capensis* ex coll. Sir A. Smith, in British Museum.
- b. Type of *seeberi*, 210 mm. (in G. & T. typ. err. 102), in British Museum.
- c. Cotypes of *seeberi*, 95 and 115 mm., in S.A. Museum.

Boulenger's Berg River (not "Burg") specimens, which belong to a well-defined species found in the Berg, Breede, and Zonder End Rivers, are consequently left without a name. For this species I propose the name *andrewi*, in commemoration of Dr. Sir Andrew Smith. The type-specimen will be Boulenger's no. 2 specimen, which presumably is the one from which his fig. 100 was drawn.

A further important distinction between the two species cannot, unfortunately, be checked on Smith's type, as the

last dorsal spine, Mr. Norman informs me, is broken off almost to the base.

Investigations are now in progress to determine the distribution of the species of indigenous freshwater fishes in the S.W. Cape. It is a matter of considerable urgency, in view of the recent introduction of the Black Bass (in addition to the trout introduced many years ago) and the probable extermination in many areas of the indigenous species.

XXIV.—*Iguana Remains from Barbados.* By W. E. SWINTON, Ph.D., F.R.S.E., Department of Geology, British Museum (Natural History).

DURING the winter of 1935-36 Dr. C. T. Trechmann spent some months investigating various geological problems in the West Indies, and during his visit to Barbados he made an interesting discovery. At the south-eastern corner of the island, below Ragged Point Lighthouse, the Scotland beds (U. Eocene) are unconformably overlain by the Coral Rock of Pleistocene age. At the exposed junction of the two Dr. Trechmann found a number of cavities filled with grey clay and phosphatized pebbles and a large number of very fragmentary bones. These last are, unfortunately, in most cases too much broken up to be of any scientific use, but it is clear that a species of iguana-like lizard and a small rodent are represented. The best of the lizard bones have been extracted and a few others built up from obviously associated fragments, and an examination of them proves them to belong to *Iguana iguana iguana* (Linné).

Remains of this species have been recorded from most of the islands of the Lesser Antilles, but none has so far been reported from Barbados. The specimens obtained recently include the greater part of the right ramus of the mandible with teeth, a complete left femur, and a number of portions of left femora (showing that several individuals are represented), the shaft of a right femur, the left coracoid, parts of the sternum, a number of vertebræ in excellent condition, and a large number of unidentifiable fragments probably from the smaller limb-bones and ribs.

The bones agree perfectly in size with those of an adult in the collection of the Zoological Department of the British Museum.

No iguanas are known to be alive in Barbados to-day, but it is clear that they occupied some neighbouring islands until comparatively recently (see Barbour, 'Zoologica,' xix, 1935, p. 105).

Their extermination in Barbados, as in the other islands, was probably brought about by the mongoose. With this new record it is seen that the species was distributed over practically the whole of the Lesser Antilles until fairly recent times, and thus strengthens the view that it was distributed naturally in this region and not introduced by man into each island.

XXV.—*A new African Hypochrysa (Neuroptera)*. By D. E. KIMMINS, Department of Entomology, British Museum (Natural History).

Hypochrysa africana, sp. n.

Somewhat smaller than *H. nobilis* Hagen; both specimens are badly discoloured, rendering it difficult to describe the colour and pattern with certainty.

♀.—Head yellowish, a dark brown spot on each gena and behind each eye; vertex reddish. Palpi blackish, narrowly yellowish at the apices of the segments. Antennæ blackish, the basal segment somewhat yellowish on its inner surface. Thorax and abdomen apparently reddish brown with yellow markings. Line of demarcation between the ninth and tenth tergites distinct. Ninth sternite in the form of a pair of short, deep, latero-ventral plates. Eighth sternite small, cordate in ventral view. Legs yellowish, femora and tibiæ brownish on their outer surfaces.

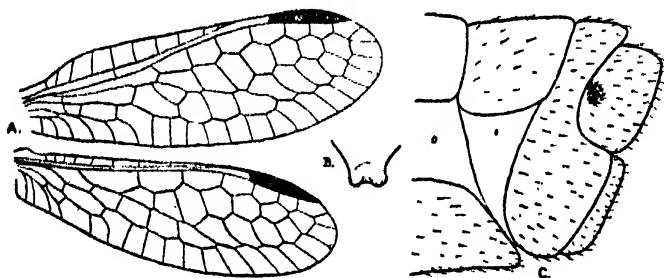
Wings hyaline; venation much as in *H. nobilis*, brown, except the costa, subcosta and radius, which are pale yellowish. Pterostigma chitinized in both wings, pale yellow.

Length of anterior wing 7 mm.; of posterior wing 6½ mm.

S. AFRICA, Cape Province, Worcester, 17–31. viii. 28 (R. E. Turner).

2 ♀♀, type and paratype in the collection of the British Museum. The type has the apex of the abdomen mounted in Canada Balsam.

The male of this species is unknown to me. The ♀ specimens were presented some seven or eight years



Hypochrysa africana, sp. n., ♀.

A. Wings. B. Eighth sternite from beneath.
C. Apex of abdomen from side.

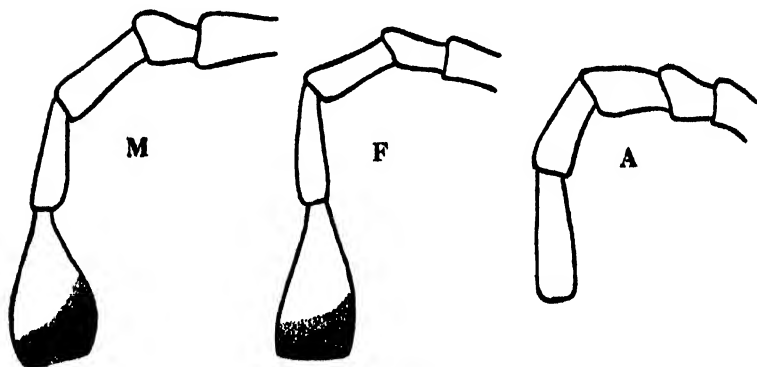
ago and I have delayed publication in the hope that more material would be available. Unfortunately, this has not been the case, and as the genus *Hypochrysa* is new to the South African list of Neuroptera I have decided to wait no longer.

XXVI.—*Moroccan Species of the Genus Stenobothrus* (Orthoptera, Acrididæ). By B. P. UVAROV, D.Sc., British Museum (Natural History).

In 1927 I described a new species *Stenobothrus palpalis* from French Morocco, remarkable for its broadly expanded palpi, which are also blackened apically (Bull. Soc. Sci. Nat. Maroc. vii. no. 7-8, 1927, p. 203, fig. 1). Only the female sex was known to me at the time, but it was natural to expect that the palpi of the male should be still more strongly specialized than in the female. It was surprising, therefore, to read notes by Werner (Sitzungsber. Akad. Wiss. Wien, mat.-nat. Kl., Abt. i. vol. cxli. Heft. 3-4, 1932, p. 136), who has obtained both sexes of the species and said that "das Merkmal, nach dem die Art ihren Namen erhalten hat,

nämlich die schwarzen Spitzen der Taster, vielfach nicht zutreffend ist und die Taster einfarbig hell erschienen, bei sonst völliger Uebereinstimmung. Ich habe mich vergeblich bemüht, in meinem ziemlich reichen Material zwischen den Exemplaren mit schwarzen und hellen Tasterspitzen irgendwelche andere Merkmale zu Unterscheidung auffinden. Herr Kustos Ramme, dem ich mein Material zusandte, bestätigte meine Auffassung."

While one might expect the disappearance of the black pigmentation of the palpi as an individual variation, it would be obviously impossible to think that the extraordinary shape of the terminal joints of the palpi in *S. palpalis* is also subject to variation. Unfortunately,



Maxillary palpi of *Stenobothrus palpalis*, male (M), female (F); and *S. amoenus*, female (A).

Werner did not seem to have paid any attention to the structure of the palpi, and the meaning of the variation reported by him remained obscure and required a re-examination of his material. I am very grateful both to Prof. Werner and Prof. Ramme for sending me some of the specimens in question. My study showed at once that two species are included in the material, one of them being typical *palpalis*, with the palpi both expanded and blackened, and another with the palpi of normal structure and pale coloration. In addition to my own and Werner's specimens, I have now before me large series of both species collected in French Morocco in 1936 by Mr. K. H. Chapman and

Mr. G. A. Bisset, and I am now able to state that there are two species of *Stenobothrus* in that country, perfectly distinct not only in the structure of the palpi, but also in the venation and other important characters. Since both these species are insufficiently known, the following comparative notes should be of use:—

S. palpalis Uvarov, 1927.

Male.

Antennæ very long, reaching the middle of hind femora, distinctly incrassate apically.

Maxillary and labial palpi with the apical joint strongly expanded and partly black.

Lateral pronotal carinæ moderately inflexed in prozona, obsolescent in metazona well before hind margin.

Scapular and interrarial fields of elytra distinctly expanded.

Second radial vein distinctly sinuate.

Discoidal area very broad, with regular venation.

S. amœnus (Brisout, 1850).

Male.

Antennæ shorter, reaching scarcely beyond the base of hind femora, not incrassate apically.

Maxillary and labial palpi simple, pale in colour.

Lateral pronotal carinæ strongly inflexed in prozona, sharp in metazona, almost reaching its hind margin.

Scapular and interrarial fields of elytra narrow.

Second radial vein straight.

Discoidal area moderately broad, with irregular venation.

Females of the two species are also easily separated by the structure of the palpi and by venation, though, of course, the specialized characters of *S. palpalis* are less developed in that sex than in the male. The affinities of *S. palpalis* are with the Spanish *S. grammicus* Caz., which differs by larger head, less distinctly expanded palpi, and scarcely sinuate second radial vein. *S. amœnus* is related to the Crimean *S. miramæ* Dirch (Bol. Soc. Esp. Hist. Nat. xxxi. 1931, p. 711), which differs, however, in the expanded scapular field of elytra.

The known distribution of the two North African species is, as follows:—

S. palpalis. French Morocco, Middle Atlas: Timhadit, 5000 ft. (Uvarov, 1927; *Chapman & Bisset*); Ain-Leuh, 1950 m. (Uvarov, 1927); Aguelman Sidi Ali, Ou Mohammed, 6500 ft. (*Chapman & Bisset*); Azrou (*Werner*); Tadlest, 2250 m. (*Werner*); Bekrit (*Rungs*); Great Atlas: Tizi N'Test, 7150 ft. (*Chapman & Bisset*).

S. amœnus. Algeria: Aumale (*Brisout*; cotypes examined). French Morocco, Middle Atlas: Timhadit, 5000 ft. (*Chapman & Bisset*); Aguelman Sidi Ali, Ou Mohammed, 6500 ft. (*Chapman & Bisset*); Azrou,

4400 ft. (Werner, whose fig. 5, l. c., refers undoubtedly to this species; Chapman & Bisset); Foz (Werner).

Both species are subject to considerable variation in the size, in the relative length of elytra, and in the degree of the apical infumation of wings. It appears that the specimens from higher levels are more short-winged.

It is not impossible that other species of the genus *Stenobothrus* will be discovered in mountains of North Africa.

XXVII.—*Monolene danæ*, a new Flatfish from Panama, caught bathypelagically. By ANTON FR. BRUUN, M.Sc., Ph.D., Charlottenlund Slot, Copenhagen. (Papers from the 'Dana' Oceanographical Collections.—No. 15.)

Description.—A flatfish of the subfamily Paralichthinae from the Gulf of Panama, belonging to the genus *Monolene* Goode, as limited by Norman (1934).

Total length 95.8 mm., standard length 82.1 mm. In percentage of standard length: depth of body 37.6, length of head 22.9, diameter of upper eye 5.1, snout 3.8, interorbital space 1.1, maxillary 6.1, lower jaw 8.4, pectoral fin-length 8.9.

Dorsal rays 103, anal 80, caudal 17, pectoral 15; lateral line scales about 112 (counted just above the l. l.).

The pigmentation (preserved in 4 per cent. formaldehyde) on the ocular side is light brownish, with about eleven larger brown spots on the dorsal fin and about eight on the anal fin, in addition to numerous small spots on both fins; caudal fin with two cross-bands of brown spots; pectoral with two dark brown, almost black cross-bands, the more posterior covering the distal third of the fin. Both on the ocular side and blind side, which is quite white, a deeper-lying pigmentation can be seen as thin black stripes along the basal parts of the radialis of the dorsal and anal; a similar stripe can also be detected in the caudal region along the vertebral column.

This specimen seems to represent a new species, *Monolene danæ*, sp. n., nearly allied to the Pacific *M. maculipinna* Garman, 1899; the latter, however, to judge from Norman's and Garman's figures, has, among other things, a smaller depth of body (ca. 30 to 35 per cent.), longer snout (4.9–5.4 per cent.), longer pectoral (12.6–18.4 per cent.), larger eye (6.3–7.5 per cent.), and larger mouth (maxillary 7.3–7.9 per cent.).

The body-form thus shows considerable agreement with the Atlantic *M. sessilicauda* Goode, *inter alia* by also having only a very small notch in front of the eyes. The numerical characters, however, exclude *M. sessilicauda*, but agree with *M. maculipinna*.

Very few specimens of the genus *Monolene* have been described, and consequently very little is known concerning the changes during growth. Until further information is available, therefore, it seems justifiable to consider the above-described specimen as type of a new species. The type is preserved in the 'Dana' collections of the Carlsberg Foundation, Charlottenlund, Denmark.

M. danæ and *M. maculipinna*, both from the Pacific, seem to be closely related in the same way as the two Atlantic species *M. sessilicauda* and *M. antillarum*. If all four species can be maintained, they form apparently two sets of geminate species in relation to the Isthmus of Panama—*sessilicauda-danæ* and *antillarum-maculipinna*.

Occurrence.—The conditions under which the specimen of *M. danæ* described was captured are very remarkable for a completely metamorphosed flatfish, generally regarded as the final bottom-stage. The place of capture was 'Dana' St. 1205 II, 6° 49' N., 80° 25' W., 14-1-1922, 4.20 h.; the specimen was taken in an open 3 m. ring-net towed with 1000 m. wire out, thus a maximum depth of 300-400 m. under the surface for the actual capture. But soundings gave the depth of bottom as 3140 m., so that *this flatfish must have lived bathypelagically at least ca. 2700 m. above the bottom.*

Among other fishes taken in the same haul may be mentioned: 1 *Nemichthys scolopaceus* Richardson, 1 *Avocettina infans* (Günther), 1 *Dolopichthys heteracanthus* Regan, 1 *Melanocetus uiger* Regan, 8 *Argyropelecus*, 10 *Vinciguerria*, 6 *Myctophum*, and 12 *Lampanyctus* and others; it was thus a rich representation of a typical bathypelagic fauna.

We might expect that a flatfish with such possibilities of wide spreading as an occasionally bathypelagic mode of life offers should have a wide distribution; yet, so far, the genus *Monolene* has only been known from the warmer parts of Atlantic and Pacific America and from fairly deep water to some extent.

REFERENCES.

- GARMAN, S. 1899. "Fishes ('Albatross')." *Memoirs Mus. Comp. Zool. Harvard Coll.* vol. xxiv. Cambridge, Mass.
 NORMAN, J. R. 1934. 'A Systematic Monograph of the Flatfishes (Heterosomata),' vol. i. British Museum (Natural History), London.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 111. MARCH 1937.

XXVIII.—*Records and Descriptions of North American Bees.* By CHARLES D. MICHENER, Pasadena, California.

THIS paper consists of descriptions of numerous new species of bees, combined with notes, which it is hoped will be useful, on other forms. Thanks for continued help and interest in my work are due to Prof. T. D. A. Cockerell and Mr. P. H. Timberlake.

Hylæus giffardiellus Cockerell.

The genitalia of a male from the type-locality of this species agree with those of *H. episcopalis* except that the base of the distal pedicel of the eighth sternite is a little narrower (doubtless a variable character). Externally the two species agree, except that in *H. episcopalis* the posterior margin of tergites 2 and 3 are more strongly depressed and more shiny, with fewer punctures than the disks of these tergites, while in *H. giffardiellus* the margins, although depressed and less closely punctate than the disks, are not so sparsely punctate or so shiny as in *H. episcopalis*. The supraclypeal mark of *H. giffardiellus* averages longer than in *H. episcopalis*. *H. giffardiellus*, then, is at best a very doubtful species, and I think probably a synonym of *H. episcopalis*.

Ann. & Mag. N. Hist. Ser. 10. Vol. xix. 21

Hylæus conspicuus (Metz).

Fort Collins, Colorado, July 4, 1900. [Colorado State Coll.]

The species is new to Colorado.

Agapostemon angelicus idahoensis, subsp. n.

Female.—Length nearly 10 mm.

Similar to *A. angelicus* but a little larger. Abdomen less bluish; scutum a little more highly polished and more sparsely punctate; striæ of basal part of propodeum very strong, straight, and transverse except for a very small median basal area, where they are finer, closer, and longitudinal. (This is not a triangular area indicating an enclosure. It is much smaller than that and of a different shape. Were it not for this area many of the striæ would extend entirely across from one side of the propodeum to the other.)

Holotype: Challis, Idaho, June 26, 1932 (*Louise Ireland*).

Perhaps this is only a variety of *A. angelicus*, but the striæ of the propodeum are very distinctive. In her recent revision of the genus * Dr. Sandhouse mentions no such specimens.

It seems to me that Dr. Sandhouse has gone a little too far in reducing certain species of this genus to synonymy. I believe that *A. californicus* Cwfd. is at least a good subspecies of *A. texanus*. I have seen about one hundred specimens of *californicus* from the coastal part of southern California. All are definitely *californicus*, as distinguished from *texanus*. It is to be said that Dr. Sandhouse has put the classification of these bees on a firm basis, as it has never been before.

Augochlora utahensis, sp. n.

Female.—Length 7 mm.

Belongs to the group of *A. pura* (Say). Eyes deeply emarginate; supraclypeal area shiny as in *A. confusa* Robertson and *A. pomoniella* Cockerell; scutum not reticulate anteriorly or laterally; tegulæ testaceous anteriorly, blackish posteriorly; enclosure of propodeum with a rounded, raised, shiny, lineolate posterior margin as in *A. pomoniella*, but this margin somewhat narrower,

* Journ. Wash. Acad. Sci. vol. xxvi. no. 2, Feb. 1936, pp. 70-83.

leaving a broader space for the striæ, which are coarser, closer, and more vermiform than in *A. pomoniella*; wings clearer than in *A. pomoniella*; wing-veins and stigma paler; posterior face of propodeum shining and impunctate as in *A. pomoniella*.

Holotype and paratype: Rockville, Utah, May 7, 1931, on *Datura* (Mrs. B. Campbell).

In *A. pomoniella* the striæ of the enclosure are fairly straight, fine, and separated by conspicuous shiny ground; in *A. utahensis* the striæ are vermiform or, at least, somewhat crooked, coarse, and about as close as possible. Perhaps this is a subspecies of *A. pomoniella*.

Halictus giffardi, sp. n.

Female.—Length 8 mm.

Rather robust, black, the head (except clypeus, supra-clypeal area, and cheeks), the scutum, and the second and third tergites, especially laterally, with a more or less strong blue-purple tinge; tegulæ with an inconspicuous brownish tint; posterior margins of second to fourth tergites slightly brown. Transfacial line longer than facial; clypeus not produced; inner orbits somewhat emarginate; clypeus and supraclypeal area shining,



Fig. 1.

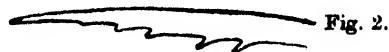


Fig. 2.

Figs. 1 & 2.—Left (upper) and right inner hind tibial spurs of the holotype of *Halictus giffardi*, sp. n. (♀).

with a few rather large punctures; sides of face with fine, not close, punctures; front finely and closely punctured; vertex very finely punctate, not quite so closely so as the front; scutum rather dull, the rather fine punctures separated by somewhat less than their diameters; tegulæ with only a few fine punctures; scutellum with rather close punctures on the margins, but disk shiny, with very few punctures, the punctures more abundant near a faint longitudinal median groove; pleura very dull, with fine close sculpture; enclosure of propodeum

about as wide as postscutellum, not margined by carina, the surface dull, with about twelve faint longitudinal folds, stronger and closer laterally; posterior face of propodeum dull, not margined by carinae; tergites slightly shiny, with only very minute piliferous punctures; sternites with coarser punctures except basally; inner hind tibial spurs with five or six short teeth, but variable, as they are not alike on the two sides (see figs. 1 & 2). Wings pale brownish, the veins and stigma brown except for the black costa and subcosta; second and third transverse cubitals weak. Pubescence dull ochraceous, not forming abdominal bands and not very abundant anywhere.

Holotype: Muir Woods, Marin County, California, July 15, 1917 (*W. M. Giffard*).

This is an isolated species, remarkable for the few and faint folds on the enclosure, for the purplish colour, etc. *H. cyaneiceps* Ckll. is black, with part of the head bluish. I place *H. giffardi* as an unusual *Evylæus*. The type will be found in the collection of the California Academy of Sciences at San Francisco.

Halictus (Chloralictus) sparsus Robertson.

Greenfield, Indiana, dates ranging from June 29 to August 10, 1935 (*H. P. Amick*); Western Maryland, July 24, 1935 (*H. P. Amick*).

Halictus (Chloralictus) ruidosensis Cockerell.

Sandia Mountains, New Mexico, 9500 to 11,000 feet elevation, August 31, 1935 (*Michener*); Pingree Park, Larimer County, Colorado, August 22, 1935 (*Michener*); Boulder, Colorado, on flowers of blue *Salvia*, September 16 (*Figgins*), and on mint, August (*Michener*); Chiricahua Mountains, Arizona, June 27, 1934 (*Fowler*).

Halictus (Chloralictus) tegulariformis Crawford.

Barstow, California, September 14, 1935, on *Cleomella obtusifolia* (*Michener Coll.*).

Halictus (Chloralictus) albuquerquensis, sp. n.

Female.—Length 4 to 4.5 mm.

Clypeus but little produced, a little more than apical half black; facial line about equal to transfacial; inner

orbits converging below; mandibles red apically; antennæ black, the flagellum dusky testaceous beneath apically; head and thorax brassy green; tegulæ black, punctate; legs black, the small joints of tarsi rufescent; lower part of clypeus coarsely punctate; upper part of clypeus, supraclypeal area, and lower sides of face finely but not closely punctate; front very finely and closely punctate; scutum rather shiny, somewhat lineolate, rather finely punctured, the parapsidal grooves not conspicuous; pleura rather coarsely punctate; enclosure of propodeum long, with a narrow, slightly raised, lineolate apical margin, otherwise strongly lineolate and granular; truncation of propodeum bounded below by weak carinæ; wings clear, the veins and stigma pale testaceous; abdomen black, the posterior margins of the tergites brownish, the tergites with very minute piliferous punctures and not or hardly lineolate; pubescence whitish, making the apical part of the abdomen pruinose.

Holotype female and two female paratypes: Albuquerque, New Mexico, September 1-3, 1935, on *Sphaeralcea* and *Grindelia*.

This species is close to *H. tegulariformis* Cwfd., but the enclosure of the propodeum is longer and granular (with weak anastomosing striæ in *tegulariformis*), the head is shorter (a little longer than broad in *tegulariformis*), and the parapsidal grooves are a little more distinct. This is apparently the form recorded as *tegulariformis* from New Mexico in the Sandhouse key (1924).

Halictus ovaliceps Cockerell.

Male.—Length nearly 6 mm.

Similar to female, having the same elongate head; anterior margin of clypeus with a broad pale yellow band having a slight median upward projection; legs beyond the femora dull red, infuscated with black; abdomen beyond third tergite black, the bases of first three tergites somewhat darkened.

Mineral King, Tulare County, California, September 3, 1934 (*Michener*).

Females are from the following localities, all in California (*Michener* Coll.):—Altadena, Pasadena, Eagle

Rock Hills, mouth of San Antonio Canyon, and Arroyo Seco, all in Los Angeles County; Mission Valley near San Diego; Giant Forest, Sequoia National Park; Hemit Valley, San Jacinto Mountains. Dates range from January 27 to August 22. Flower records are *Pæonia brownii*, *Phacelia tanacetifolia*, *Salix*, *Baccharis*, and *Lotus*.

Halictus kincaidii Cockerell.

The male of this species has never been described, although it has been recorded by Hinman and Larson (Ent. News, June 1935) from the Willamette Valley, Oregon (det. Sandhouse).

Male.—Length about 7 mm.

Similar to female; antennæ black, short for a male; legs black, the tarsi slightly reddish; clypeus black; striæ on propodeum somewhat stronger than in female.

Both sexes are easily recognized among western forms by the coarsely reticulate pleura of both sexes. Both this and the preceding species were first identified for me by Mr. P. H. Timberlake.

Westwood Village, Los Angeles, California, July 14 to August 4, 1930 (*Irene Wilson*); Los Angeles, July 16, 1933 (*Michener*); Altadena, July 31, 1934 (*Michener*); San Gabriel Canyon, San Gabriel Mountains, June 17, 1933, on *Radicula nasturtium-aquaticum* (*Michener Coll.*); Muir Woods, Marin County, July 15, 1917 (*W. M. Giffard*). This seems to be chiefly a coastal species.

Nomia californiensis, sp. n.

Female.—Length a little over 9 mm.

Black; underside of flagellum brown; eyes strongly convergent below; clypeus with rather small close punctures, forming longitudinal lines; vertex with smaller separated punctures; scutum and scutellum with rather large punctures, among which, especially on scutellum, are smaller ones; central part of scutum only a little less densely punctured than sides; scutum dull in comparison with that of *N. californica* Ckll.; enclosure of propodeum much like that of *N. californica*; tegulæ nearly black; wings slightly brownish, the veins and stigma dark brown, the basal vein strongly bent as

in *Halictus*; abdomen black, tergites 2 to 4 with broad hyaline (not in the least greenish) posterior margins; surface of tergites rather dullish, with moderate-sized rather widely separated punctures, the posterior margin of first tergite depressed and finely and closely punctate, the posterior parts of following tergites more sparsely punctate than basal parts, the hyaline margins impunctate; pubescence white except for a few black hairs in centre of third tergite, more on fourth, and many all over fifth and sixth; white pubescence fairly abundant, copious on face and pleura, forming a narrow conspicuous band (broken medially) around posterior edge of pronotum (not extending below tubercles but widening to cover tubercles), forming a similar band covering postscutellum, and a third but much less conspicuous band along the suture between scutum and scutellum.

Holotype female: Cushmanbury Springs, San Bernardino County, California, August 19, 1932 (*Michener*). This locality is on the north side of the San Bernardino Mountains, in a desert region, but a large damp area around the springs introduces mesophytic conditions.

This species is very distinct from other North American *Nomia*. The group of *N. nevadensis* Cress. has the basal vein slightly curved as in *Andrena*. On the chance that this might ordinarily have green bands which failed to become coloured in the type I attempted to identify it with one of the green-banded species. However, these forms also have the slightly curved type of basal vein. Moreover, I have never seen a specimen of a green-banded species which did not show at least some green or yellowish colour. In addition to the character of venation, there are many other things which separate this form from other American *Nomia*.

Nomia tetrazonata Cockerell.

Two males from Cathedral City, Riverside County, California, on *Larrea tridentata* var. *glutinosa*, April 10, 1936 (*Michener*). The tarsi of these specimens are black. The species is new to California.

Diandrena ablegata Cockerell.

Hayden, Colorado, June 14, 1907 (*S. A. Johnson*). [Colorado State Coll.] This species is new to Colorado.

Macropis steironematis Robertson.

Wellsville, Kansas, June 22, 1901. [Colorado State Coll.]

Pseudopanurgus aurifodinæ, sp. n.

Male.—Length almost 5 mm.

Black, the labrum, mandibles except tips, entire clypeus, square supraclypeal mark, dog-ear marks (faintly notched above and extending a little above upper margin of supraclypeal mark), and lateral face-marks (tapering to a point above level of bases of antennæ and separated from dog-ear marks by a slight notch) bright yellow; antennæ black, reaching to the postscutellum; tegulæ testaceous; wings slightly dusky apically, the veins and stigma dusky; apices of femora yellow; tibiæ yellow, the fore and middle pairs with a short broad black band beneath, the hind pair with a black area on inner side of apical half; tarsi yellow, the claw-joints black and the small joints of hind tarsi infuscated with black; transfacial line considerably longer than facial line; clypeus somewhat produced; process of labrum emarginate apically; clypeus with an inconspicuous median groove; head rather finely and closely punctate, the yellow parts less closely punctate than vertex, the front dull and very finely and closely punctate; scutum, especially medially, more finely punctate than most of vertex; propodeum roughened throughout, the enclosure with rather weak striæ; tergites very finely and closely punctate except for the broad apical depressed margins which are shiny and impunctate; basal parts of raised areas of second to fourth tergites transversely lineolate; posterior part of raised area of first tergite more coarsely and sparsely punctate than elsewhere on abdomen; pubescence sparse, whitish, that of dorsum of head and thorax ochraceous; tergites beyond the first with sparse fringes of long white hairs extending from the apical margin of the raised area of each tergite nearly to the apical margin of the tergite.

Holotype male: Gold Mountain, San Bernardino Mountains, California, August 27, 1932 (*Michener*). This locality is in an oak and pinon-pine region, the upper extremity of the upper sonoran zone on the desert side of the mountains.

This species is not closely related to any other. The small size, the largely yellow face and legs, and the black tubercles and antennæ are distinctive. Probably *P. irregularis* (Ckll.) (*Panurginus*) is as close as any species, but the antennæ are differently coloured, etc.

This species and *P. californicus* (Cress.) are the only known California *Pseudopanurgus*. This is very striking when compared with more than forty in the Rocky Mountain area, three in Lower California, and several in South America.

Pseudopanurgus abdominalis (Cresson).

Two males from St. Johns, Kansas, June 6, 1926 (*E. G. Anderson*).

Apparently because of the somewhat unusual superficial appearance of this species it has remained in our lists as *Calliopsis*. However, all of its characteristics seem to point toward a close relationship with the slender group of *Pseudopanurgus*.

Pseudopanurgus is easily divisible into two groups. Typical *Pseudopanurgus* (type *P. æthops*) are rather large, robust, coarsely punctate forms, in which the first joint of the labial palpi is much longer than the next three together. The other group includes the great majority of the species (mostly described as *Panurginus*), and consists of smaller, slender, more finely punctate forms, in which the first joint of the labial palpi is about equal to the next three together. This latter group may be called *Heterosarus* Robertson. Most of the species have the tibial scopa plumose, but in *P. (H.) parvus* (Cresson), *bakeri* (Cockerell), and probably some others the scopa is simple. These are typical *Heterosarus*, *parvus* being the type. There are various degrees of plumosity among those forms having the scopa plumose. *P. inuptus* (Cockerell) has the most plumose scopa of any species examined by the author.

In a recent paper (*Can. Ent.*, Dec. 1935, p. 275) on *Panurginus* I gave a key to certain species. I find an error in this key. I have stated that *P. gabrielis* has a deeply emarginate clypeus. In reality the emargination is nearly as shallow as in *P. gracilis*. *P. gabrielis* has more punctures on the clypeus than *P. gracilis*, has a normal scutum, and is otherwise quite different from

P. gracilis. A new locality record for *P. gabrielis* is Altadena, California, February 28, 1932 (*Michener*).

I find also, after studying additional specimens, that my interpretation of *P. armaticeps* Ckll. was in error. I had mixed two distinct though closely related species, believing that there was but one variable form. Both are more shiny than any of the other black-faced species, and the males may be separated thus :—

P. armaticeps Ckll.

Cheeks armed with great teeth.

Head averaging larger, with straighter, longer mandibles.

Process of sixth sternite with a broad shallow emargination, much as in Crawford's figure of *atriceps*, although the process is not so long as in that species.

P. bilobatus, sp. n.

Cheeks unarmed.

Head averaging smaller, with more strongly bent, shorter mandibles.

Process of sixth sternite with a shallow, narrow emargination, the lobes on either side each about as wide as the emargination.

Panurginus armaticeps Cockerell.

Mouth of San Antonio Canyon, Los Angeles County, California, April 2, 1933, on *Salix* (*Michener*); Tetleys Mountain Camp, San Bernardino Mountains, California, May 16, 1936, on *Ceanothus* and *Nemophila* (*Michener*). The first locality is only a few miles from Claremont, the type-locality, and the specimen shows paler legs and tegulae, as called for in the description, than the other specimens, in which these parts are black. The female described in my recent paper is *P. bilobatus*, but female *armaticeps* differs chiefly in the slightly larger size and more robust form.

Panurginus bilobatus, sp. n.

Panurginus armaticeps Michener (not Ckll.), Can. Ent., Dec. 1935, p. 277, all records except mouth of San Antonio Canyon.

Holotype male, allotype female, and paratypes: Eagle Rock, California, on *Rhamnus crocea*, the holotype collected on April 7, 1936, the allotype on May 5, 1935. Additional localities were recorded in my previous paper.

Panurginus armaticeps, *bilobatus*, *melanocephalus*, *nigrihirtus*, *nigrellus*, and *occidentalis* have the cheeks of the male broad above; but *P. gracilis*, *gabrielis*, *bakeri*, and *cressoniellus* have narrow cheeks. The first definite locality record for *P. bakeri* Crawford is St. Mary's Glacier, Colorado, August 1929 (collector unknown).

Calliopsis bernardinensis, sp. n.

Male.—Length about 6.5 mm.

Black, the mandibles except tips, labrum, clypeus, dog-ear marks, supraclypeal area, lateral face-marks (slanting from the base of antennæ to the apex far up on the eyes), underside of scape, a broken line on collar, tubercles, sometimes a spot on anterior end of tegulæ, tips of femora, basitarsi, outer sides of tibiæ, second tarsal joint on middle legs, and second and third on fore legs bright yellow; underside of flagellum reddish brown; tegulæ darker brown; facial line much shorter than transfacial; vertex extremely finely punctate; scutum very finely but closely punctate, more finely so than in *C. pugionis* Ckll.; scutellum a little more coarsely punctate than scutum; enclosure of propodeum longitudinally striate; posterior face of propodeum, just below enclosure, smooth and shiny; abdomen black, very finely punctate, with whitish hair-bands; dorsum of thorax covered with rather short pale grey hairs; hair on sides of thorax longer and less dense; supraclypeal area smooth and polished; clypeus rather coarsely punctate; venter of abdomen, particularly at sides and posteriorly, slightly rufescent.

Female.—Length 7.5 mm.

Similar to male, but scape without yellow, hind legs without yellow, middle legs yellow at knees and bases of basitarsi; fore legs yellow at apices of femora, on outer sides of tibiæ except subapically, where yellow is constricted to a band, or tibiæ with yellow on basal half of outer side only; base of anterior basitarsis sometimes with a short yellow line exteriorly; pubescence at apex of fifth and sixth tergites brown; pubescence of scutum shorter and browner than in the male.

Holotype male, allotype female, and paratypes: Erwin Lake, August 22, 1932. Paratype: Big Bear Lake, August 16, 1932. Both localities are in the San Bernardino Mountains, California. The specimens were collected by the author.

The female is easily recognized by the entirely yellow clypeus, yellow dog-ear plates, etc. The male is similar to *C. coloradensis* Cress., but the tubercles are yellow, and in both sexes the abdomen is duller, more finely and

closely punctate, than in *coloradensis*—in fact, the abdomen is duller than in any other species of *Calliopsis* which I have seen, its surface being much like that of female *Hesperapis wilmattæ* Ckll.

Hypomacrotera subalpina (Cockerell).

One male, Albuquerque, New Mexico, September 1–3, 1935, on *Sphæralcea* (Michener).

Spinoliella lawæ, sp. n.

Female.—Length 7.5 mm.

Black, the following parts pale yellowish: mandibles at base; lateral face-marks up to level of antennæ; semilunar supraclypeal mark; large anterior lateral areas on clypeus; posterior ends of tegulæ; broad bands on tergites 1 to 4, those on 1 and 2 broken, that on 2 most widely, the others narrowed medianly, and all with shallow sublateral posterior emarginations. Underside of flagellum, stripe on anterior side of fore tibiæ, and tarsi except for hind and middle basitarsi brown; wings clear, the veins and stigma pale brown; pubescence, including that at apex of abdomen, rather sparse and pale, that at anterior end of scutum pale ochraceous; tegulæ, where not yellow, slightly brownish; clypeus dull, coarsely punctate, with a large *depressed shiny punctate triangle*, pointed upward; rest of face rather coarsely punctate, the punctures not anywhere elongated; scutellum shiny, coarsely and sparsely punctate, almost impunctate in centre; scutellum coarsely punctate throughout, more closely so than scutum; abdomen rather indistinctly punctured back to the fifth segment, where it is more coarsely so; enclosure of propodeum a little striate in the middle, dull and unsculptured at the sides; basal joint of labial palpi about the length of clypeus; remaining joints decreasing distally in length, together a little shorter than first; facial line considerably shorter than transfacial.

Holotype: Gull Lake, Mono County, California, July 3, 1934 (*Mrs. J. E. Law*).

In Cockerell's key (1898) this species runs to *S. scitula* (Cress.). The impressed triangle on the clypeus separates *lawæ* from both *scitula* and *australior*, the two species which seem most nearly related.

Spinoliella triangulifera Cockerell.

Placer County, California, 6600 feet elevation, August 24, 1916 (*W. M. Giffard*).

The male has not been described.

Male.—Length nearly 6 mm.

Very similar to *S. edwardsii* (Cress.), but smaller; wings a very little greyer.

Spinoliella edwardsii (Cresson).

This is a common species in the mountains of California. A female from Florence Lake, Sierra Nevada Mountains, Fresno County, elevation 7300 feet, July 1931 (*Michener*), agrees closely with Cresson's description except that the clypeus is entirely black. A male with the same data agrees with Cresson's description except that the bands on tergites 3 and 4 are broken medially and that on 5 is broken medially and sublaterally.

From Loyds, Tulare County, July 2, 20, August 3 and 13, 1935 (*W. A. Evans*) are numerous specimens which are conspicuously different from the more northern and typical *S. edwardsii*. This form may be described as follows :—

Spinoliella edwardsii media, subsp. n.

Female.—Similar to typical *S. edwardsii*, but lateral face-marks long, extending above the level of the antennæ; supraclypeal area and mandibles with more yellow; labrum sometimes partly yellow; clypeus yellow, with a few large blackish dots, or the dots expanded into two longitudinal black bars, or the yellow confined to a median bar which is broadened above and to sublateral spots; tergites 1 to 5 with yellow bands, broken medially, or those of third and fourth tergites continuous; median section of second band very narrow and sometimes represented by two narrow transverse submedian spots; band of fifth tergite broad, not narrowed toward the interruption as are the other bands, although sometimes represented by large lateral spots.

Male.—Similar to typical *S. edwardsii*, but lateral face-marks long and tapering above, reaching beyond the level of the antennæ; supraclypeal area with more yellow; first four abdominal bands often unbroken.

The holotype and allotype were collected on August 3 at the above-mentioned locality

Numerous specimens from Bluff Lake, San Bernardino Mountains, July 16, 1934, and one from Big Bear Lake, San Bernardino Mountains, July 16, 1934, all on *Potentilla bolanderi* var. *bernardina* (Michener Coll.) are like the above-described form from Tulare County, except that the wings of both sexes are greyish (not reddish), the first four abdominal bands of the males are more consistently unbroken, and the flagellum in both sexes is a little darker beneath. An abnormal male has no band on first tergite, bands of second and fourth broken into four spots, band on third broken medially, and that of fifth represented by small lateral spots; clypeus with two longitudinal black bars. This form may be known as *Spinoliella edwardsii bernardina*, subsp. n., the holotype female and allotype male being from Bluff Lake (additional data given above).

Spinoliella zebrata (Cresson).

Hubbard Ranch, Elbert, Colorado, on flowers of *Gilia calcaria*, June 3 (*Figgins*); North-east Larimer County, Colorado, August 27, 1935, on *Astragalus* (*Michener*). The female from the latter locality has the clypeus black except for the anterior lateral corners and an inconspicuous median dot.

Conanthalictus seminiger, sp. n.

Female.—Length 4 mm.

Slender, form of *C. bakeri* Cwfd.; face much broader than long; inner orbits about parallel; antennæ black; head green, the clypeus only slightly so; thorax black, the pleura green, the propodeum very faintly dark greenish; abdomen black, the apical margins of the segments very faintly brownish; wings clearer (less brownish) than in *C. bakeri*. The structure is as in *C. bakeri* except for the broader face.

Holotype female: Eagle Rock Hills, Los Angeles County, California, April 14, 1933, on *Rhamnus crocea* (*Michener* Coll.).

The other described broad-faced species (*C. bakeri* Cwfd., *C. wilmattæ* Ckll., and *C. macrops* Ckll.) are entirely green.

This was first recognized as a new form by Mr. P. H. Timberlake.

Conanthalictus bakeri Crawford.

Altadena, California, May 11 and 18, 1935, on *Phacelia tanacetifolia* (Michener Coll.).

Hesperapis parva, sp. n.

Male.—Length 4 mm.

Black, the under side of flagellum yellow ferruginous, the upper side dusky ferruginous; apices of mandibles rufescent; tegulae dark testaceous; facial line considerably shorter than transfacial; inner orbits strongly converging below; propodeum largely shiny and impunctate; scutum and scutellum shining, especially centrally, and very finely punctate, more closely so laterally; wings clear, the apices perhaps very faintly milky; veins and stigma piceous; vertex more shiny than scutum; abdomen rather shiny, finely punctured; pubescence white, densely covering the face up to the vertex, fairly abundant on thorax as usual, forming rather weak abdominal bands, and covering the last two segments of abdomen; antennae short, the joints of flagellum broader than long.

Female.—Length 5 mm.

Similar to male, but flagellum black above; mandibles with more red; dorsum of thorax a little duller; pubescence less abundant, not covering face, the clypeus shining, with few punctures; pubescence of dorsum of head and thorax faintly ochraceous; scutum with a little moss-like hair mixed with the longer hairs; abdominal bands more conspicuous than in male; pygidial plate reddish; tegulae paler.

Holotype male, allotype female, and four paratypes from Palm Springs, Riverside County, California, on *Eriogonum inflatum*, May 11, 1935 (Michener).

This is our smallest *Hesperapis*. It is apparently closest to *H. leucura* Ckll., but is considerably smaller, the front is not dull, etc.

Hesperapis carinata Stevens.

One male, Fort Hall, near Blackfoot, Idaho, August 21, 1934 (Louise Ireland).

Halictoides sandhouseæ, sp. n.

Male.—Length about 6 mm.

Head and thorax green, the front blue in the holotype, the scutum and vertex often with a coppery tint; propodeum black; dorsum of head and thorax rather closely punctate, the punctures coarsest on front; cheeks and sides of thorax rather sparsely punctate; enclosure of propodeum with numerous close parallel striæ; posterior face of propodeum practically impunctate; tegulæ black, rather hyaline posteriorly; apices of mandibles red; antennæ black, the flagellum brownish beneath except at base; scape very broad, oval; segments of flagellum mostly broader than long; one side of flagellum with numerous long, slightly curled hairs, sparser apically; legs black, the femora somewhat dilated; middle and hind tibiæ broadened, the latter broadest beyond the middle; hind tarsi broadened, the joints 2 and 3 with short processes on one side; wings brownish, the veins and stigma dark brown; abdomen black, the posterior margins of the segments hyaline, the tergites, especially posteriorly, very faintly greenish; punctation of abdomen fine and sparse, especially anteriorly; posteriorly punctures more numerous and conspicuous, mostly piliferous; sternites 2 and 3 with inconspicuous subapical lateral tubercles; sixth sternite brownish subhyaline medially, this area narrowed posteriorly by the chitinous, raised, black lateral areas of the sternite; pubescence white, not forming distinct abdominal bands, exceedingly long on lower edges of hind tibiæ; apex of abdomen sometimes with some brownish and a very few fuscous hairs.

Female.—Length 6.5 mm.

Similar to male, except for the usual sexual characters; punctures of dorsum of head and thorax finer and denser; flagellum very short; striæ of enclosure of propodeum finer; abdomen a little less metallic; pubescence dull whitish or faintly ochraceous, with fuscous hairs intermixed on sides of face, front, vertex, scutum, scutellum, and apex of abdomen; apex of abdomen also with some pale ferruginous hair; tibiæ with some dark hair externally.

Holotype male, allotype female, and paratypes: Altadena, California, April 19, 1935, on *Eschscholtzia*

californica. Paratypes: La Crescenta, California, April 20, 1935, on *Eschscholtzia californica*; Eagle Rock, California, February 22, 1935, on *Gilia multicaulis* (all Michener Coll.).

I had thought that this might be *H. viridescens* Cwfd., but Dr. Sandhouse writes me that in *viridescens* the male flagellum is without long hairs.

(To be continued.)

XXIX.—*New or little-known Tipulidæ (Diptera)*.—LII.
Australasian Species. By CHARLES P. ALEXANDER,
Ph.D., F.R.E.S., Massachusetts State College, Amherst,
Massachusetts, U.S.A.

THE new species of crane-flies herein described are all from various parts of eastern Australia, including Tasmania and Lord Howe Island. They were derived from a considerable variety of sources that are acknowledged herewith: material from New South Wales, Victoria, and Tasmania, collected by Mr. F. Erasmus Wilson, now preserved in the Wilson Collection; specimens preserved in the Macleay Collection, University of Sydney, sent to me through the kindness of Mr. Frank H. Taylor, collected by the latter, Miss Irwin-Smith, and Mr. Plomley; further specimens in the National Collection at Canberra, taken by Mr. André L. Tonnoir; one interesting species in the Deutsches Entomologisches Museum, sent through the friendly interest of Dr. Walther Horn; a few additional species preserved in my own series of these flies, collected by Miss Kathleen English and by Mr. William Heron. I wish to express my deepest thanks to all of the entomologists mentioned above for this continued aid in making known the Tipulidæ of Australia.

Ischnotoma fuscobasalis, sp. n.

Mesonotal præscutum with lateral margins golden-yellow, the disk with four conspicuous dark brown stripes, the interspaces obscured; pleura clear light grey; halteres dusky; femora yellow, the tips narrowly blackened; wings with a brownish tinge, variegated

by obscure whitish areas, including the outer two-thirds of cell R_5 and across outer ends of cells Cu and 1st A .

Female.—Length about 16 mm. ; wing 16.5 mm.

Frontal prolongation of head brown; nasus very long, approximately one-third the length of the prolongation itself; palpi dark brown. Antennæ with the scape and pedicel light brown, flagellum brownish black; flagellar segments nearly simple, with very inconspicuous verticils. Head dark brown, the orbits very narrowly and insensibly grey.

Mesonotal præscutum with the lateral margins golden-yellow, the disk with four conspicuous dark brown stripes, the interspaces pale brown to yellowish brown; scutum and scutellum dark brown, the median region of former obscure yellow pollinose; mediotergite grey, with a basal triangular area. Pleura clear light grey, the dorso-pleural region infuscated. Halteres dusky, the extreme base of stem pale yellow. Legs with the coxæ clear light grey; trochanters yellow; femora obscure yellow, the tips narrowly blackened; tibiæ light brown, the tips narrowly brownish black; tarsi black. Wings with a brownish tinge, the outer radial field more conspicuously darkened; stigma pale brown, its proximal end somewhat darker; whitish areas before stigma in cells C , Sc , and R_1 ; across bases of cells 1st M_2 and M_3 ; and with less evident pale areas in outer two-thirds of cell R_5 , base of cell 2nd M_2 , and near outer ends of cells Cu and 1st A .

Abdominal tergites almost uniformly dark brown, the lateral portions narrowly obscure yellow; basal segments not reddish, as in *abnormalis* and other allied species; sternites brownish yellow, the caudal margins of the segments restrictedly pale. Ovipositor with the valves slender.

Hab. Victoria.

Holotype, ♀, bred from larva taken in mud at margin of permanent stream, mountains above Warburton, altitude 3800 feet, emerged January 13, 1931 (*F. E. Wilson*).

The nearest ally of the present fly seems to be *Ischnotoma abnormalis* Alexander, which differs in the obscure orange or reddish basal abdominal segments and the distinctive wing-pattern.

Dolichopeza (Dolichopeza) albescens, sp. n.

Allied to *brevifurca*; general coloration very pale, whitish, the præscutum with three scarcely indicated more reddish stripes; wings relatively broad, pale cream-yellow, the stigma and seams on anterior cord and *m-cu* brown; *m-cu* about its own length before fork of *M*; abdomen pale yellow; male hypopygium with the outer dististyle pale throughout.

Male.—Length about 10 mm.; wing 11 mm.

Frontal prolongation of head very pale yellow; palpi yellow. Antennæ with the scape and pedicel whitish yellow, the flagellum pale brown. Head whitish.

Mesonotum whitish, the præscutum with three slightly more reddish stripes, the centres of the scutal lobes similarly patterned; posterior sclerites of mesonotum whitish or testaceous. Pleura pale whitish yellow. Halteres pale yellow, the bases of the knobs a little darker. Legs with the coxæ and trochanters whitish; remainder of legs pale yellow, the outer tarsal segments a trifle darker. Wings relatively broad, pale cream-yellow throughout, the stigma, a small cloud on anterior cord, and a conspicuous seam on *m-cu* infuscated; veins yellow to brownish yellow, darker in the infuscated areas. Venation: outer medial forks deeper than in *brevifurca*; *m-cu* about its own length before fork of *M*; cell 2nd *A* relatively wide.

Abdomen pale yellow, the outer sternites somewhat darker, their caudal margins pale. Male hypopygium somewhat as in *brevifurca* and *fuscoradialis*, especially in the nature of the toothing of the tergite. Outer dististyle pale throughout, the more basal tooth at near mid-length, the smaller outer tooth placed far distad, being closer to the apex than the distance between the two teeth; apex of style beyond second tooth less than one-half the basal portion proximad of basal or first tooth.

Hab. New South Wales.

Holotype, ♂, Sydney (*Luddemann*); Deutsches Entomologisches Museum.

Paratopotype, ♂.

The pale whitish or yellowish-white coloration of the present fly suggests *Dolichopeza (Dolichopeza) pallidula* Alexander, which is a quite distinct species. Despite its

coloration the present fly is most nearly allied to *D. (D.) brevifurca* Skuse and *D. (D.) fuscoradialis* Alexander, being readily told by the wing and body coloration and by the breadth of the wings. The pale spots before and beyond the stigma are inevident in the present fly, due to the uniformly pale colour of the wing-disk.

Dolichopeza (Dolichopeza) kurandensis, sp. n.

Allied to *dorrigensis*; mesonotum and pleura dark brown, the latter with a broad oblique pale stripe extending from præscutal humeri to posterior coxæ; legs dark brown, the genua, tips of all tibiæ, very narrow proximal ends of basitarsi, broad tips of basitarsi, and remaining tarsal segments snowy-white; wings with cells *C* and *Sc* distinctly infuscated; wing-apex and seams on cord narrowly but conspicuously darkened; cell *2nd A* reduced to a narrow strip; male hypopygium with caudal margin of tergite with four blackened, microscopically serrulate lobes; outer dististyle short, dark-coloured.

Male.—Length about 7 mm.; wing 7.6 mm.

Frontal prolongation of head white; palpi dark brown, the incisures somewhat paler. Antennæ with basal two segments yellow, flagellum black; flagellar segments cylindrical, gradually decreasing in length outwardly, the last a tiny thimble-shaped structure; verticils shorter (on proximal segments) to subequal to the segments. Front and anterior vertex whitish; remainder of head rich brown, the occipital region somewhat paler.

Pronotum dark brown. Mesonotum chiefly dark brown, the humeral region of præscutum obscure yellow; præscutum with indications of darker stripes, including a median line that is further split by a capillary pale vitta. Pleura dark brown, with a broad oblique pale stripe extending from the præscutal humeri across the anepisternum, and ventral pteropleurite, on to the meral region and posterior coxæ. Halteres elongate, pale, knobs darkened. Legs with the fore and mid-coxæ darkened basally, the tips pale, posterior coxæ chiefly pale; trochanters pale yellow; femora dark brown, the bases paler, the extreme tips snowy-white; tibiæ brown, the bases very narrowly, the tips broadly, white,

the amount of the latter least on fore and middle tibiæ, becoming two or three times as extensive on the posterior tibiæ, where approximately the outer fifth is pale; basitarsi darkened, the extreme base white, the tips conspicuously snowy-white, narrowest on fore tarsi, widest on posterior tarsi where the dark subbasal ring is only about twice as extensive as the white tibial apex; remainder of tarsi snowy-white. Wings with a strong brown tinge, cells *C* and *Sc* distinctly infuscated; wing-apex and margin of posterior border as far back as tip of *Cu* narrowly darkened; stigma conspicuous, dark brown; cord narrowly but conspicuously darkened, more broadly so on anterior cord; veins dark brown. Venation: anterior cord transverse to somewhat oblique, with *Rs* lying opposite or slightly more distad than the other elements; cell *2nd A* reduced to a linear strip.

Abdominal tergites dark brown; sternites light yellow, the incisures broadly dark brown; hypopygium pale. Male hypopygium with the caudal margin of tergite crenate into four low lobes, the border heavily blackened and microscopically serrulate; lateral ventral lobes likewise heavily blackened and serrulate. Outer dististyle unusually short, dusky in colour, not exceeding two-thirds the total length of the inner style, provided with long coarse setæ that are approximately one-half the length of the style itself. Inner dististyle with the apical half narrowed into a long dark-coloured beak.

Hab. North Queensland.

Holotype, ♂, Kuranda, altitude about 1100 feet (*F. H. Taylor*).

The nearest described ally of the present fly is undoubtedly *Dolichopeza* (*Dolichopeza*) *dorrigenis* Alexander (northern New South Wales), which is the only other Australian species having cell *2nd A* similarly long and narrow. In the present fly, the cell is even narrower than in *dorrigenis*, and so marks the culmination, as known, of this condition in the Australian fauna. The wings of *dorrigenis* are not or scarcely patterned, except for the conspicuous stigma. Other species of Australian *Dolichopeza* having the leg-pattern of this general nature include the species that centre about *annulipes* Skuse and *oresitropa* Alexander, readily told by the conspicuous bilobed setiferous phallosome.

Dolichocheza (Dolichocheza) segnis, sp. n.

Mesonotum dark brown; pleura yellow, only the anepisternum a little darkened, the sternopleurite and meron clear yellow; femoral tips narrowly dirty white; tibiae brownish black, the tips paling to dirty white, on the posterior legs including about the distal third; wings greyish, the small brown stigma conspicuous; outer longitudinal veins and *m-cu* not seamed with brown.

Female.—Length about 9 mm.; wing 7.5 mm.

Frontal prolongation of head yellow; palpi dark brown. Antennae broken beyond the third segment, dark brown. Front and anterior vertex light yellow; remainder of head dark brown.

Mesonotum dark brown, the præscutum with four scarcely apparent darker brown stripes; median area of scutum, scutellum and mediotergite slightly more testaceous-brown. Pleura yellow, including the sternopleurite and meron, only the anepisternum a little more darkened; dorsopleural region infuscated. Halteres elongate, brownish black. Legs with the coxæ and trochanters light yellow; femora testaceous at base, passing into brown, the tips of the femora very narrowly and insensibly paling to dirty white; tibiae brownish black, the tips narrowly and insensibly paler, most conspicuous on the posterior tibiae, where the entire distal third fades from brown to dirty white; tarsi of all legs chiefly white. Wings greyish, the brown stigma conspicuous, smaller than in *dauidsoni*; outer radial field only vaguely darkened; a very narrow dark seam on anterior cord; whitish areas before and beyond stigma small but conspicuous; longitudinal veins beyond cord, together with *m-cu*, not seamed with brown, as in *dauidsoni*. Venation: elements of anterior cord, including *Rs*, in perfect transverse alignment; in *dauidsoni*, these are slightly oblique, with cell *R*₅ lying a little more distad; *R*₅ decurved outwardly, paralleling *R*₄₊₅ throughout its length; *m-cu* nearly its own length before fork of *M*; cell 2nd *A* a little wider than in *dauidsoni*, vein 2nd *A* lying opposite mid-length of basal section of *Cu*₁.

Abdominal tergites almost uniformly brownish black, the lateral portions of the outer segments paler; sternites

dark, the caudal margins of the outer segments conspicuously paler.

Hab. New South Wales.

Holotype, ♀, Dorrigo, eastern Dorrigo, altitude about 2000 feet, February 12, 1933 (*W. Heron*).

The nearest described ally of the present fly is undoubtedly *Dolichopeza* (*Dolichopeza*) *dauidsoni* Alexander, which differs in the conspicuously darkened sternopleurite and meral region, the abruptly whitened tips of the femora and tibiæ, and in the heavily patterned outer cells of the wing. Other small species of the genus, as *D. (D.) dorrigenis* Alexander and *D. (D.) kurandensis*, sp. n., are readily told from all regional forms by the unusually long and very narrow cell 2nd *A* of the wings.

Limonia (Libnotes) plomleyi, sp. n.

Belongs to the *notata* group; general coloration dark brownish grey; thoracic pleura almost uniformly darkened, heavily pruinose; halteres black; fore femora almost uniformly blackened, middle and hind femora dark brown with the tips broadly and conspicuously blackened; wings with a restricted pale brown pattern that is confined to the vicinity of the veins; free tip of *Sc*₂ and *R*₂ in transverse alignment; abdomen dark brown, sparsely pruinose; cerci at tips strongly bifid.

Female.—Length about 13 mm.; wing 15 mm.

Rostrum and palpi black. Antennæ with scape and pedicel dark brown, flagellum paler brown. Head brownish grey; anterior vertex reduced to a narrow strip.

Pronotum brownish black. Mesonotal præscutum dark brownish grey, vaguely marked with somewhat darker brown, most evident as lateral and posterior intermediate stripes, the latter produced behind into narrow points that almost reach the suture; scutum pale medially, the lobes variegated with somewhat darker brown; scutellum chiefly pale, the parascutella darker; mediotergite chiefly pale, darker laterally. Pleura almost uniformly dark brownish grey, the mesepisternum, pteropleurite, and pleurotergite uniformly darkened, pruinose. Halteres blackened throughout. Legs with the coxæ darkened; trochanters obscure yellow; fore

femora almost uniformly blackened, only the bases narrowly paler; middle and posterior femora dark brown, the tips broadly and conspicuously blackened, the amount subequal on both pairs; tibiæ brown, the tips narrowly blackened, the bases more narrowly and vaguely so; tarsi brown, passing into black. Wings with a weak brown tinge, restrictedly patterned with pale brown clouds, including vague areas at origin of R_s ; along cord and outer end of cell 1st M_2 ; tip of Sc_1 ; free tip of Sc_2 and R_2 ; and as vague seams at outer ends of veins R_{4+5} , M_4 , Cu_1 , 1st A , and 2nd A ; veins brownish yellow, darker in the clouded areas; prearcular region blackened. Venation: free tip of Sc_2 and R_2 in transverse alignment; $m-cu$ at between one-fourth and one-fifth the length of the lower face of cell 1st M_2 .

Abdomen dark brown, sparsely pruinose; cerci brownish black basally, strongly bifid at tips.

Hab. New South Wales.

Holotype, ♀, Barrington Tops, January 10, 1934 (N. J. B. Plomley).

I take great pleasure in naming this fly in honour of the collector, Mr. N. J. B. Plomley. The nearest described ally is *Limonia* (*Libnotes*) *clintoni* Alexander (north-eastern Papua), which differs especially in the coloration of the thoracic notum and pleura and in the yellow antennal flagellum. Both species differ conspicuously from other members of the *notata* complex of forms by the black fore femora.

Limonia (*Geranomyia*) *deleta*, sp. n.

Allied to *austropicta*; rostrum short; mesonotum reddish brown, the præscutum with three darker brown stripes; pleura uniformly brownish yellow; wings greyish with a scarcely evident pattern; Sc ending just beyond one-fourth the length of R_s ; $m-cu$ its own length before the fork of M ; male hypopygium with long rostral spines, arising from the summit of a common blackened tubercle; mesal-apical lobe of gonapophysis smooth.

Male.—Length, excluding rostrum, about 5 mm.; wing 6 mm.; rostrum 1.6 mm.

Rostrum dark brown throughout, relatively short and stout. Antennæ dark throughout; flagellar segments oval, with long verticils. Head dark, the anterior vertex more silvery.

Pronotum grey. Mesonotal præscutum reddish brown, grey pruinose, with three slightly darker brown stripes, the median one subobsolete in front; posterior sclerites of mesonotum reddish, the centres of the scutal lobes darkened; a median dark vitta on scutum and scutellum; mediotergite pale, with indications of a capillary dark vitta. Pleura uniformly brownish yellow, without darkening. Halteres pale, the knobs darkened. Legs with the coxæ and trochanters obscure yellow; remainder of legs yellowish brown, the outer tarsal segments darker. Wings with a greyish tinge, the stigma and a circular cloud at origin of *Rs* very slightly darker; remainder of cord, outer end of cell 1st M_2 , and wing-tip not darkened; veins brown. Venation: *Sc* short, Sc_1 ending just beyond one-fourth the length of *Rs*, Sc_2 at its tip; *m-cu* its own length before the fork of *M*; vein 2nd *A* strongly sinuous at mid-length.

Abdominal tergites brownish black, the sternites paler. Male hypopygium with the ventral dististyle relatively small, fleshy, the two long straight rostral spines equal in length, but the inner appearing slightly shorter because of arising slightly lower down on the face of the common basal tubercle; in slide mounts, the spines reach to opposite the summit of the small fleshy style. Gonapophyses with mesal-apical lobe darkened, with smooth margins.

Hab. New South Wales.

Holotype, ♂, Tallong, altitude 2013 feet, October 1931 (*F. H. Taylor*).

The unique type is apparently somewhat teneral, but since the body-colours are distinct it would appear that the wing-pattern, if normally present, would be indicated. The nearly immaculate wings contrast notably with the condition found in *Limonia* (*Geranomyia*) *austropicta* Alexander (*picta* Skuse, preoccupied). The details of the male hypopygium, as the small fleshy ventral dististyle and the smooth margins of the gonapophyses, furnish other distinctions.

Limonia (Geranomyia) conjurata, sp. n.

Size very large (wing, ♂, 9.5 mm.); general coloration of thorax black, the præscutum and dorsal pleura with four linear velvety-black dashes; femora brown, the tips narrowly blackened; wings with a strong brown tinge, variegated by a series of about four darker brown subcostal areas; *Sc* relatively short, *Sc*₁ ending shortly beyond the origin of *Rs*; basal section of *Sc*₂ lacking; free tip of *Sc*₂ lying far before *R*₂ so *R*₁ is unusually long, only a little shorter than *R*₂₊₃; male hypopygium with the lateral lobes of tergite produced into spinous points; a single long rostral spine on ventral dististyle.

Male.—Length, excluding rostrum, about 8 mm.; wing 9.5 mm.; rostrum about 3 mm.

Rostrum relatively short, only a little longer than the antennæ, light brown; labial palpi short; maxillary palpi apparently 3-segmented. Antennæ black throughout; flagellar segments oval, strongly constricted at both ends, giving a bead-like appearance to the organ; verticils coarse, longer than the segments. Head dark grey; anterior vertex narrower than diameter of the scape.

Pronotum and mesonotum dull black; mesonotal præscutum with humeral and lateral portions paler, more buffy, the lateral borders of the præscutal disk velvety-black; extreme lateral border of the sclerite before the suture similarly lined with velvety-black; median region of scutum scarcely brightened; mediotergite sparsely pruinose. Pleura dark plumbeous brown, the dorso-pleural membrane more buffy, with two linear velvety-black streaks lying just ventrad of the two on the præscutum. Halteres dusky, the base of stem restrictedly pale. Legs with the coxæ dark; trochanters obscure yellow; femora brown, the tips narrowly blackened, the amount subequal on all legs; tibiæ and tarsi black. Wings (fig. 1) with a strong brown tinge, the interspaces of cell *Sc* more yellowish; a series of about four darker subcostal areas, the first just beyond arculus, the second at the supernumerary cross-vein in cell *Sc*, the third at origin of *Rs*, the fourth, paler and ill-defined, at free tip of *Sc*₂; cord and outer end of cell 1st *M*₂ narrowly and very insensibly seamed with

darker; veins dark. Venation: *Sc* relatively short, *Sc*₁ ending shortly beyond origin of *Rs*; basal section of vein *Sc*₂ lacking; a supernumerary cross-vein in cell *Sc* at near mid-length of the vein; free tip of *Sc*₂ lying far before *R*₂, so vein *R*₁ is unusually long, not much shorter than *R*₂₊₃ or *Rs*; *m-cu* shortly beyond fork of *M*.

Abdominal tergites black, the caudal borders of the intermediate segments obscurely paler; subterminal

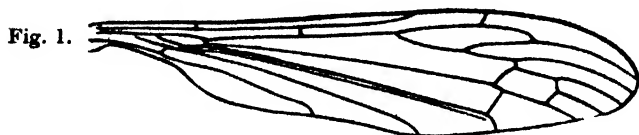


Fig. 1.

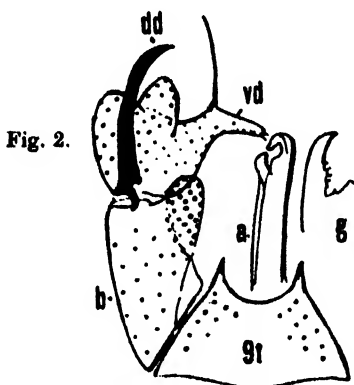


Fig. 2.

Fig. 1.—*Limonia (Geranomyia) conjurata*, sp. n.; venation.

Fig. 2.—The same; male hypopygium.

(Symbols: *a*, aedeagus; *b*, basistyle; *dd*, dorsal dististyle; *g*, gonapophysis; *t*, 9th tergite; *vd*, ventral dististyle.)

segments uniformly black; sternites brown; hypopygium brownish black. Male hypopygium (fig. 2) with the caudal margin of the tergite, 9*t*, with a deep U-shaped emargination, the lateral lobes produced into acute spinous points. Dorsal dististyle, *dd*, a gently curved black rod, the tip acute. Ventral dististyle, *vd*, deeply bilobed, the mesal lobe nearly equal in size to the outer lobe, the dorsal dististyle lying in the notch; rostral prolongation strong and powerful, shortly beyond

mid-length bearing a single long spine that is about one-half longer than the prolongation beyond the point of its insertion; rostral spine sessile or arising from a scarcely evident basal tubercle. Gonapophyses, *g*, with the mesal-apical lobe straight, its outer edge with a few microscopic denticles.

Hab. New South Wales.

Holotype, ♂, Barrington Tops, altitude 5000 feet, January 10, 1934 (*N. J. B. Plomley*).

Limonia (*Geranomyia*) *conjurata* is very different from all other regional species of the subgenus. In some respects it suggests *L. (G.) sakaguchii* (Alexander) of the Riukiu Islands, but is only distantly allied. The great size and structure of the male hypopygium readily separate the species from all other Australian members of the subgenus.

Limonia (*Dicranomyia*) *muta*, sp. n.

General coloration dark brown; antennæ black throughout; rostrum relatively elongate; sides of mesonotal præscutum obscure yellow; halteres dark brown; the base of stem narrowly yellow; wings tinged with brown, the stigma darker; male hypopygium with the rostral spines widely separated, the outermost placed at near mid-length of the prolongation, the inner on side of base of the rostrum.

Male.—Length about 5.5–5.5 mm.; wing 5.8–6.6 mm.

Rostrum pendant, relatively elongate, fully one-half the remainder of head, dark brown; palpi brownish black. Antennæ black throughout; flagellar segments oval, the outer segments more elongate. Head yellowish brown to dark brown.

Mesonotal præscutum obscure yellow laterally, the disk dark brown or black, the posterior sclerites of the notum brownish black; thorax relatively gibbous. Pleura brownish testaceous to dark brown. Halteres dark brown, the base of stem narrowly yellow. Legs with the coxæ and trochanters brownish testaceous; remainder of legs yellowish brown to brown, the tarsi still darker. Wings tinged with brown, the stigma darker brown; very narrow and scarcely evident cloudings along cord and outer end of cell 1st *M*₂; veins brown. Venation: *Sc*₁ ending a short distance before origin

of R_s , Sc_1 alone from one-half to two-thirds R_s ; R_s relatively short, arcuated, a little longer than the basal section of R_{4+5} ; $m-cu$ close to fork of M .

Abdominal tergites dark brown, the sternites more obscure yellow. Male hypopygium with the caudal margin of tergite deeply notched, the conformation of the incision being almost exactly like that of the lobes. Dorsal dististyle relatively slender, curved, the tip obtuse. Ventral dististyle with the rostral prolongation long and slender, with two very widely separated spines, the distance between the two approximately three-fourths the length of a single spine; outer spine placed at or near mid-length of the prolongation, the inner one on the side of the base of the rostrum; spines not arising from basal tubercles. Gonapophyses with mesal-apical lobe slender, smooth, gently curved.

Hab. Victoria.

Holotype, ♂, Belgrave, in tree-fern gully, March 31, 1929 (*F. E. Wilson*).

Paratopotype, ♂, *paratype*, ♂, Macedon, in tree-fern gully, March 24, 1929 (*F. E. Wilson*).

The widely separated spines of the rostral prolongation of the male hypopygium, in conjunction with the infumed wings, readily separate the present fly from other regional allies.

Limonia (Dicranomyia) saxemarina, sp. n.

General coloration dark brown; rostrum a little exceeding the remainder of head; antennæ black throughout; wings strongly tinged with blackish, stigma lacking; Sc short; cell 1st M_2 open by the atrophy of m ; male hypopygium with the ventral dististyle fleshy, the rostral prolongation bispinous.

Male.—Length about 4.5 mm.; wing 5.5 mm.

Rostrum brown, relatively elongate, a little exceeding the remainder of head; palpi dark brown. Antennæ black throughout; flagellar segments oval. Head dark brown; anterior vertex of moderate width, subequal to the diameter of the scape.

Mesonotum almost uniformly dark brown, the præscutum and scutum somewhat paler near the suture; præscutum gibbous. Pleura brown. Halteres brownish black throughout. Legs with the coxæ and trochanters

brown; remainder of legs paler yellowish brown. Wings strongly tinged with blackish; stigma indistinct; veins a little darker than the ground-colour. Almost complete series of macrotrichia on veins beyond cord. Venation: Sc short, Sc_1 ending some distance before origin of R_s , Sc_2 a little shorter than Sc_1 ; free tip of Sc_2 and R_2 both pale and in transverse alignment; cell 1st M_2 open by the atrophy of m ; cell M_3 subequal in length to its petiole; $m-cu$ at fork of M , subequal to distal section of Cu_1 ; cell 2nd A wide.

Abdominal tergites brownish black; sternites a little paler. Male hypopygium with the tergite relatively long, narrowed outwardly, the apex shallowly emarginate. Basistyle with the ventro-mesal lobe low, conspicuously setiferous. Dorsal dististyle a strongly curved sclerotized rod, the distal fourth more narrowed. Ventral dististyle fleshy; rostral prolongation very slender, at its base with two black spines, the more basal from a low tubercle, the outer spine nearly sessile. Gonapophyses with mesal-apical lobe slender, the margins smooth.

Hab. Lord Howe Island.

Holotype, ♂, North Bay, on rock by the sea-shore, February 11, 1934 (*V. Irwin-Smith*).

I am indebted to Miss Irwin-Smith for the privilege of retaining the type-specimen.

Limonia (*Dicranomyia*) *saxemarina* is readily told from all other Australasian members of the subgenus by the coloration and venation of the wings, especially the open cell 1st M_2 .

Austrolimnophila irwin-smithæ, sp. n.

General coloration grey, the præscutum with three dark brown stripes, the median one broadest; antennal flagellum black; femora obscure brownish yellow, the tips narrowly infuscated; wings yellowish, with rather numerous pale brown spots that are confined to the vicinity of the veins; R_{2+3+4} subequal in length to the basal section of R_5 ; R_{2+3} and R_3 subequal.

Female.—Length about 7.5–8 mm.; wing 7.5–8 mm.

Rostrum grey; palpi brownish black. Antennæ with the scape grey; pedicel reddish brown; flagellum black; flagellar segments oval, the terminal segment

a little longer than the penultimate. Head brownish, the anterior vertex light grey; a narrow dark brown line on posterior vertex.

Pronotum grey. Mesonotal præscutum grey, with three dark brown stripes, the median one broadest; pseudosutural foveæ reduced; median region of scutum grey, the lobes extensively dark brown; scutellum obscure yellow, the parascutella dark; mediotergite dark brown; pleurotergite darkened, paler along the posterior border. Pleura chiefly pale, the anepisternum and dorsal sternopleurite more pruinose; ventral sternopleurite darkened. Halteres chiefly pale yellow, the knobs weakly darkened. Legs with the coxæ reddish, sparsely pruinose; trochanters reddish yellow; femora obscure brownish yellow, the tips narrowly infuscated; tibiæ and tarsi yellowish brown, the outer segments of the latter a little darker. Wings yellowish, with rather numerous small pale brown spots, distributed as follows: areculus; origin of R_s ; Sc_2 ; stigma; tips of all longitudinal veins excepting R_5 ; forks of R_{2+3+4} and M_{1+2} ; cord and outer end of cell 1st M_3 ; a darkened cubital seam; veins brown, darker in the clouded areas. Venation: Sc_1 and Sc_2 subequal; R_{2+3+4} subequal to basal section of R_5 or $r-m$; R_{2+3} and R_3 subequal; $m-cu$ more than one-half its length beyond fork of M .

Abdomen dark, the caudal margin of tergites narrowly reddish, of the sternites more broadly so.

Hab. Tasmania.

Holotype, ♀, Mount Wellington, bred from larva collected February 13, 1921; pupated March 8-10, 1921; emerged March 18, 1921 (*V. Irwin-Smith*); collector's no. Q 3.

Paratopotypes, 2 damaged ♀♀, emerged March 15 and 18, 1921, one with the cast pupal skin; collector's nos. Q 2 and 4.

Type in the University of Sydney Collection, through Miss Irwin-Smith.

I take great pleasure in naming this very distinct crane-fly in honour of the collector, Miss Vera Irwin-Smith, who has done such excellent work on the biology of the Australian Diptera. The species is readily told from all other Australian and Tasmanian members of the genus by the small size and pattern and venation of the

wings. The most similar form in Tasmania is the large and conspicuous *Austrolimnophila relictæ* Alexander. The present fly is more generally similar to certain small Chilean and New Zealand species, as *A. hazelæ* Alexander and *A. truncata* (Alexander). In addition to the bred adults described above Miss Irwin-Smith sent me a small lot of preserved larvæ and pupæ that will be described by later students of the immature stages of these flies.

Gynoplistia (*Paralimnophila*) *englishæ*, sp. n.

Size small (wing, ♂, 7-8 mm.); antennæ of male very long, exceeding one-half the length of body, with twelve or thirteen long branches; flagellum bicolorous; mesonotal præscutum and pleura lined with black; legs with genua narrowly whitened; tarsi chiefly snowy-white; wings creamy, with a heavy brown pattern; *m-cu* from one-third to one-fifth its length beyond the fork of *M*; abdominal tergites brown, the caudal borders of the segments rather broadly blackened.

Male.—Length 9-10 mm.; wing 7-8 mm.; antenna about 5.5 mm.

Rostrum dark brown; palpi somewhat paler brown. Antennæ (♂) elongate, exceeding one-half the length of the body, with 15 or 16 segments, the formula being 2+12+1 or 2+13+1; scape and pedicel pale yellow; flagellar segments bicolorous, black, the apical portion adjoining the origin of the branch pale yellow, clearest and most conspicuous on the basal and intermediate segments, becoming more restricted and obscure on the outer segments; flagellar branches long, the longest (about mid-length of the organ) exceeding one-fourth the length of the antenna or nearly four times the length of the segment; segments unusually long, widely separating the branches; pubescence of branches pale, conspicuous. Head brownish grey, the centre of the vertex darkened.

Mesonotal præscutum buffy-grey, narrowly lined with dark brown or brownish black, including three intermediate stripes, the median one longer and more distinct than the laterals; anterior and lateral portions of the lateral præscutal stripes bordered by blackish, the mark confluent with the lateral intermediate stripes; pseudosutural foveæ pale; posterior sclerites of mesonotum

pale, with a broken median brown line; scutal lobes and posterior border of mediotergite variegated by darker. Pleura pale, sparsely grey pruinose, with a relatively broad black longitudinal stripe extending from the ventral cervical sclerites to the mediotergite; dorso-pleural region yellow. Halteres dusky, the knobs brownish black. Legs with the coxæ and trochanters yellow; femora brownish yellow, becoming darker outwardly, deepening to a subterminal dark brown ring, the extreme tips pale; tibiæ dark brown, the bases narrowly white, subequal in degree to the femoral tips; tips of tibiæ very narrowly pale; tarsi snowy-white, fore and middle basitarsi with about the proximal half blackened, the posterior pair entirely white. Wings with the ground-colour creamy, chiefly obscured by brown suffusions, best indicated in the radial and outer medial fields; cells *C* and *Sc* infuscated; stigma dark brown; a dark cloud in cell *R* at about one-third the length of cell; smaller clouds at outer ends of veins *R*₄ and *R*₅; most longitudinal veins narrowly seamed with darker, in the outer medial field more or less broken into dots; a large dark cloud at origin of *Rs*, enclosing a pale central spot immediately beyond this origin; an incomplete ocelliform area near the outer end of *Rs*; veins dark. Venation: *m-cu* from one-third to one-fifth its length beyond the fork of *M*.

Abdominal tergites brown, the caudal borders of the segments rather broadly blackened; sternites clear yellow with dark posterior borders; hypopygium chiefly darkened. Male hypopygium with the gonapophyses appearing as pale blades, the apex of each produced laterad into a small acute point.

Hab. New South Wales.

Holotype, ♂, Buckmaster's Crossing, Yass, November 25, 1933 (*K. English*).

Paratopotypes, 2 ♂♂, November 22, 1933.

I dedicate this very distinct crane-fly to the collector, Miss Kathleen English, to whom I am particularly indebted for much interesting material from the vicinity of Yass. Among the described species, the fly is most similar to *Gynoplistia* (*Paralimnophila*) *leucophæata* (Skuse), from which it is readily told by the bicolorous antennæ, wing-pattern, and details of venation. The

latter species is still known only from the type-specimens, taken by Skuse in the near vicinity of Sydney. Building operations in recent years have destroyed the type-stations for *leucophæata*. The species has 17-segmented antennæ, not 16-segmented as intimated by Skuse, with the flagellum uniformly dark brown.

Gynoplistia (Paralimnophila) gracilirama, sp. n.

General coloration grey, the præscutum with four brown stripes; antennæ (♂) 14-segmented, with nine long branches; femora obscure yellow, the tips broadly and abruptly blackened; posterior tarsi extensively yellow; wings whitish, spotted and washed with dark and pale brown; male hypopygium with the apex of tergite convexly rounded; gonapophyses appearing as narrow yellow blades, the tips extended into slender points.

Male.—Length about 9 mm.; wing 8.2 mm.; antenna about 4.2 mm.

Rostrum light grey; palpi black. Antennæ (♂) 14-segmented, the formula being 2+9+3; black, the scape pruinose, the incisures of the basal two flagellar segments obscure yellow; flagellar branches long and slender, the longest (about flagellar segment five) one-fourth the length of the entire organ; last branch a trifle longer than the penultimate segment; penultimate segment about one-half longer than the terminal. Head grey, the region of the vertical tubercle a little darker.

Mesonotum light grey, the præscutum with four brown stripes, the intermediate pair narrow, separated by a ground line of approximately one-half their own width; pseudosutural foveæ black, conspicuous; scutal lobes variegated with two brown areas. Pleura light grey, with two more blackish-grey longitudinal stripes, the more dorsal one longer, extending from the cervical region to beneath the wing-root; ventral pleural stripe darkened. Halteres obscure yellow, the knobs black. Legs with the coxæ pale brown, pruinose; femora obscure yellow, the tips broadly and abruptly blackened; tibiæ yellow, the bases narrowly, the tips more broadly, blackened; mid-tarsi black; fore tarsi black with the basitarsi a little paler; posterior tarsi with the proximal

two segments yellow, narrowly tipped with black, the remaining segments black. Wings with the ground whitish, heavily spotted and washed with dark and paler brown; cells *C* and *Sc*, together with the prearcular region, light yellow; two major dark areas in the subcostal field, not involving cell *C*, the first at mid-distance between arculus and origin of *Rs*, the second, larger and quadrate in outline, at origin of *Rs*, not reaching vein *M* behind; small and inconspicuous brown areas at arculus and *Sc*₂; stigmal area large, confluent with a broad seam along cord; a dark area at outer end of vein *R*₃; slightly paler brown clouds at outer end of cell 1st *M*₂ and fork of *M*₁₊₂; paler greyish-brown washes in apical cells, in cells *M* to 2nd *A*, inclusive, and as a conspicuous seam along the outer end of vein *M*; veins pale brown, darker in the clouded areas, more yellowish in the interspaces of anterior half. Venation: cell *M*₁ about one-half longer than its petiole; *m-cu* not far beyond the fork of *M*.

Abdominal tergites brownish grey, the margins of the segments darker brown; sternites obscure yellow, narrowly bordered by dark brown. Male hypopygium with the apex of tergite gently convex, not truncated as common in the subgenus. Apex of inner dististyle simple. What appears to be the anal tube lies beneath the tergite, its apex conspicuously emarginate. Gonapophyses appearing as slender glabrous yellow blades, the tips prolonged into long, spear-like points.

Hab. Tasmania.

Holotype, ♂, National Park, January 11-15, 1933 (*F. E. Wilson*).

The only other *Paralimnophila* with fourteen antennal segments in the male sex, with the flagellum bearing nine long branches, is *Gynoplistia* (*Paralimnophila*) *shewani* Alexander of northern New South Wales. The latter is readily told by the pattern of the legs, having the genua pale, and the tarsi chiefly whitened.

Gynoplistia (*Paralimnophila*) *pectinella*, sp. n.

General coloration grey, the præscutum with three dark brown stripes; antennæ 13-segmented, with seven branched segments, the branches unusually short;

femora black, the bases yellow; tarsi black; wings whitish, heavily patterned with brown; male hypopygium with the gonapophyses densely covered with yellowish spines or spinous setæ.

Male.—Length about 8.5 mm.; wing 8.2 mm.; antenna about 1.6 mm.

Rostrum grey; palpi brownish black. Antennæ small, 13-segmented, the formula being $2+7+4$; branches unusually short for the male sex in this subgenus, the longest (flagellar segment four) about a fifth longer than the segment itself; branch of the seventh flagellar segment merely protuberant; penultimate segment small and subglobular, possibly abnormal in the unique type. Head dark grey, the centre of vertex somewhat more brownish; vertical tubercle faintly apparent.

Pronotum brownish grey. Mesonotal præscutum grey, with three dark brown stripes, the laterals slightly more intense; posterior interspaces a little suffused with brown; pseudosutural foveæ large, black; posterior sclerites of notum grey, the scutal lobes variegated with dark brown; mediotergite somewhat darker laterally. Pleura light grey, with a blackish longitudinal stripe across the dorsal anepisternum and pteropleurite; ventral sternopleurite somewhat darkened but pruinose. Halteres yellow, the knobs brownish black. Legs with the coxæ and trochanters light yellow; femora black, the bases yellow, the amount subequal on all legs and including about the proximal fourth or fifth; fore and middle tibiæ and tarsi black; posterior tibiæ and basitarsi obscure brownish yellow, narrowly tipped with brown; remainder of tarsi black. Wings with the ground-colour whitish, heavily patterned with brown; prearcular region clear light yellow; cells *C* and *Sc* brown; the dark pattern appears chiefly as three more or less interrupted brown bands, the first at the level of origin of *Rs*, the second at cord, the third at wing-tip; an extensive wash in cells *M* and *Cu*, connecting the first two dark bands along vein *M*; a quadrate area in cell *R* at near mid-distance between arculus and origin of *Rs*; the darkened apical band variegated by pale spots near outer end of cell *R*₅ and in base of cell *M*₁; somewhat darker brown areas at tip of vein *R*₅ and fork of *M*₁₊₂; centre of cell 1st *M*₃ pale; brown washes in outer ends

of cells M_4 , Cu , 1st A , and 2nd A ; axillary region slightly darkened; veins yellow, darker in the clouded areas, the prearcular veins brighter yellow; bullate areas on R_5 on both sides of $r-m$, basal section of M_{1+2} , basal section of M_3 , and across $m-cu$. Venation: cell M_1 about one-third longer than its petiole; $r-m$ reduced; $m-cu$ more than one-third its length beyond the fork of M .

Abdomen dark brown, more or less pruinose. Male hypopygium with the inner dististyle very shallowly emarginate at apex. Gonapophyses appearing as slightly divergent yellow blades, the tips weakly bidentate, the surface with abundant appressed yellow spines, arranged in more or less distinct longitudinal rows or crests.

Hab. Tasmania.

Holotype, ♂, National Park, January 1933 (*F. E. Wilson*).

Gynoplistia (*Paralimnophila*) *pectinella* is readily told from all regional allies by the unusually reduced number of antennal segments and the shortness of the flagellar branches, the extensively blackened legs, the distinctly banded wing-pattern and the structure of the gonapophyses of the male hypopygium. The most similar described species is *G. (P.) decincta* Alexander, which is in all regards a very distinct fly.

Gymnastes (*Paragymnastes*) *fulvogenualis*, sp. n.

Mesonotal præscutum yellow, with three confluent blue-black stripes; pleura yellow, the mesepimeron with a sparse whitish bloom; femora and tibiæ (♀) black, the genua conspicuously and abruptly fulvous; wings black, fasciate with white; cell 1st M_2 closed; abdominal tergites purplish black, the sternites and genital segment orange.

Male.—Length about 6.5 mm.; wing 6.3 mm.

Female.—Length about 8.5 mm.; wing 7.3 mm.

Female.—Rostrum and palpi black. Antennæ with the scape and pedicel black above, more yellowish on lower face; flagellum black; segments oval, decreasing in size outwardly. Head above black, sparsely pruinose, beneath obscure yellow.

Pronotum orange. Mesonotal præscutum with the humeri and broad lateral margins orange-yellow, the

remainder of disk covered by three confluent blue-black stripes, the mid-region at suture narrowly yellow and vaguely split behind by a capillary pale vitta; scutal lobes similarly blue-black, the median area yellow; scutellum yellow, the parascutella more obscured; postnotum yellow, the posterior third of mediotergite blackened. Pleura yellow, the mesepimeron with a sparse whitish bloom. Halteres obscure yellow, the knobs dark brown. Legs with the coxæ and trochanters yellow; femora black, the bases not brightened, the tips narrowly and abruptly fulvous; tibiæ black, the bases narrowly fulvous, the amount a trifle less than the femoral tips; basal two segments of tarsi more or less yellow, tipped with black, on the second segment including about the distal half of the segment, on the posterior legs much more extensive on the fore and middle legs; terminal tarsal segments black. Wings black, fasciate with white, the latter colour including a nearly complete subterminal band that is nearly as wide as the darkened apex beyond; a white band before cord, extending from *R* to margin, subequal in width to the subterminal band, parallel-sided; broken pale areas at and near wing-base, including the axillary region in anal cells, in cell 1st *A* involving more than the basal half of cell, at its outer end the area encroaching upon the outer end of cell 2nd *A*; subbasal whitish areas in cells *R* and *M*; prearcular region more yellowish; veins dark brown, paler in the whitish fasciæ. Venation: R_{1+2} and R_3 subequal, the latter rather faintly indicated; cell 1st M_2 closed, the veins issuing from it elongate; *m-cu* a little less than its own length beyond fork of *M*.

Abdominal tergites purplish black; sternites orange, narrowly ringed on caudal margins with yellow; genital segment and ovipositor orange; cerci elongate, gently upcurved.

Male.—The male that is considered as belonging to this species is very different in coloration, as is frequent in the Australian members of the subgenus. It differs from the female, as above described, as follows:—Postnodal mediotergite uniformly pale. Legs beyond trochanters uniformly blackened. Wings with the disk chiefly pale, the margins, and especially the apex, darkened; a pale brown fascia crosses the wing at the

level of *Rs*. Abdomen orange, the seventh tergite blackened.

Hab. New South Wales (Federal Capitol Territory).

Holotype, ♀, Blundell's, January 7, 1930 (*A. L. Tonnoir*).

Allotopotype, ♂, with the type.

Paratopotype, ♀, December 21, 1930 (*R. J. Tillyard*).

Gymnastes (*Paragymnastes*) *fulvogenualis* is most nearly allied to *G. (P.) nigripes* Alexander, differing especially in the thoracic pattern and the conspicuous and abrupt fulvous genua on the otherwise black femora and tibiæ of the female.

Gymnastes (Paragymnastes) clitellaria, sp. n.

General coloration yellow, the præscutum with three confluent black stripes that form a dorsal shield; dorsal mesepimeron and sternopleurite blackened, pruinose; legs of male black, of female with tips of femora broadly orange; wings of male almost uniformly darkened beyond cord, of female dark brown, fasciate with whitish; abdominal tergites of male blackened, of female purplish black.

Male.—Length about 6.5 mm.; wing 7 mm.

Female.—Length about 7–7.5 mm.; wing 6.5–7.3 mm.

Male.—Rostrum and palpi black. Antennæ with scape obscure yellow, pedicel and flagellum black. Head black, silvery grey pruinose, especially in front.

Pronotum orange-yellow. Mesonotal præscutum orange-yellow, with three black stripes that are fused into a shield-shaped area, restricting the ground-colour to the humeral and lateral regions and to an area at the suture; postnotum yellow, the caudal portion of the mediotergite blackened. Pleura yellow, the anepisternum and sternopleurite blackened, pruinose. Halteres with stem obscure brownish yellow, the knobs dark brown. Legs beyond the trochanters black. Wings beyond the cord almost uniformly darkened, variegated only by slight washes; basal half of wing variegated by an incomplete fascia before cord and a similar brightening in bases of cells *R* and *M*; prearcular region, bases of anal cells, and basal portions of cells *C* and *Sc* pale. Venation: *R*₁ present; cell 1st *M*₂ closed; veins beyond cell 1st *M*₂

Abdominal tergites chiefly black, the bases of segments 1 to 4 restrictedly yellow on either side of mid-line; sternites orange-yellow, the subterminal segments restrictedly darkened; hypopygium dark-coloured.

Female.—Differs from male, as described, in the following regards:—Legs with femora broadly yellow on outer third to half, the basal portion darkened; tibiae chiefly obscure brown; basal two segments of tarsi yellow, tipped with black; succeeding segments black. Wings dark brown with whitish fasciae, the outer two bands narrower than the darkened apex; outer pale band a little narrower than the one before cord; wing-base extensively variegated by pale. Abdominal tergites purplish black.

Hab. New South Wales.

Holotype, ♂, Dorrigo, altitude about 2600 feet, December 15, 1932 (*W. Heron*).

Allotopotype, ♀, February 10, 1931.

Paratopotypes, 3 ♂♂, November 30 to December 15, 1932; 2 ♀♀, March 29, 1931 (*W. Heron*).

The present species is most closely allied to *Gymnastes* (*Paragymnastes*) *fulvogenualis*, sp. n., in the male sex differing in the darkened thoracic pleura, black abdominal tergites, and the wing-pattern, especially the darkened cells beyond cord; in the female the darkened sternopleurite and the broad pale femoral tips readily separate the two flies.

Tasiocera nodulifera, sp. n.

General coloration of thorax light brown; antennae (male) relatively short, not or scarcely exceeding the body in length, the flagellar segments strongly nodulose; R_{2+3+4} short; cell 1st M_2 closed; abdomen dark brown, the hypopygium paler; male hypopygium with the dististyle massive, more or less mitten-shaped, terminal in position; phallosome appearing roughly lyriform, entirely yellow, the outer arms appearing as straight smooth spines that converge outwardly.

Male.—Length about 3 mm.; wing 4 mm.

Rostrum brown; palpi dark brown. Antennae black throughout, of moderate length, a little longer than the body; flagellar segments with the basal enlargements

unusually swollen, producing a nodulose or bead-like effect. Head brown.

Thorax rather light brown to yellowish brown throughout, the pleura a little paler. Halteres relatively elongate, dusky. Legs chiefly pale, the vestiture dark; outer segments more infuscated. Wings with a strong brown tinge, the veins and macrotrichia somewhat darker. Venation: R_{2+3+4} short, subequal to basal section of R_5 ; cell 1st M_2 closed; vein 2nd A relatively long, ending nearly opposite the origin of Rs ; cell 2nd A long and narrow.

Abdomen dark brown; hypopygium large, testaceous-yellow. Male hypopygium with the dististyle terminal in position, short, broad and massive, gradually narrowed outwardly, the blunt tip blackened and coarsely but indistinctly toothed; surface of style roughened and provided with scattered coarse punctures. Phallosome very distinct, the structure appearing sublyriform; lateral arms appearing as straight yellow spines that converge outwardly, the tips nearly contiguous; these arms entirely smooth, gradually narrowed to the acute tips; from the centre of the lyriform mass protrude two much smaller yellow spines that lie side by side at the mid-line of the structure.

Hab. New South Wales.

Holotype, ♂, Megalong Valley, October 20-30, 1930 (F. E. Wilson).

Paratopotype, ♂.

Tasiocera nodulifera is strikingly different from all other regional species having the dististyle of the male hypopygium terminal in position. The shape of the phallosome suggests species such as *T. bucephala* Alexander, but the dististyle is quite different from that of any other described species. The general appearance of the fly, especially the strongly nodulose antennæ, is more like that of certain regional species of *Molophilus*, as *M. distinctissimus* Alexander, but the fly is a true *Tasiocera*.

Tasiocera otwayensis, sp. n.

General coloration black; antennæ (male) elongate, nearly twice the length of the entire body, the flagellar

segments only slightly nodulose; male hypopygium with the dististyle terminal in position, stout basally, the lower angle produced into a slender pale arm; phallosome appearing roughly lyriform, each side produced into a stout spine, with tiny denticles at base and with about two larger appressed lateral spines at mid-length of the axial one.

Male.—Length about 2.5–2.6 mm.; wing 3.3–3.4 mm.

Rostrum and palpi black. Antennæ elongate, nearly twice the length of the entire body, black throughout; flagellar segments very long, feebly constricted beyond the slight basal swelling. Head black.

Thorax black. Halteres and legs black throughout. Wings with a strong dusky tinge, the veins slightly darker; macrotrichia brown. Venation: R_{2+3+4} approximately three times the basal section of R_5 ; cell 1st M_2 closed; vein 2nd A short, ending a short distance beyond arculus, the cell narrow.

Abdomen black, the hypopygium brownish black. Male hypopygium with the dististyle terminal in position, the basal half broad, the apex concave or subtruncate, the outer angle produced into a blackened flange, the lower or inner angle drawn out into a slender pale arm, its tip obtuse. Tip of basistyle produced into a triangular pale point. Phallosome appearing as a conspicuous blackened spinous point on either side, these spines directed mesad to appear somewhat lyriform, the spine bearing small acute denticles in addition to two appressed major teeth that are approximately one-half the size of the primary point.

Hab. Victoria.

Holotype, ♂, Beech Forest, Turton's Pass, Otway Peninsula, January 11–19, 1932 (*F. E. Wilson*).

Paratopotypes, 2 ♂♂; *paratypes*, ♂, Crowes, January 11–19, 1932; ♂, Hordern Vale, January 1932 (*F. E. Wilson*).

Tasiocera otwayensis is very different from all other described species of the genus. In the shape and terminal position of the dististyle the fly most nearly resembles the larger *T. bucephala* Alexander, but the structure of the phallosomic complex is entirely different.

XXX.—Note on the Excretory System of the Trematode Genus *Maritrema* Nicoll, 1907, and the Systematic Position of the Microphallinae Ward, 1901. By MIRIAM ROTHSCHILD.

IN 1907 Nicoll expressed the opinion that the Xiphidio-cercaria described in that year by Lebour as *Cercaria oocysta* was the larval stage of a *Maritrema* Nicoll, 1907. Lebour (1910) herself endorsed this view. Sinitzin (1911) held that two related species of Cercariæ probably developed into adults of the subfamily Microphallinae Ward, 1901, and quoted a private letter from Lühe supporting this theory. Recently I have proved this experimentally by feeding encysted *C. oocysta* to the Black-headed Gull; *Maritrema* sp. was recovered from the intestine*.

An opportunity was thus afforded of studying the excretory system, a brief description of which is given below.

In the cercaria of *C. oocysta* the main excretory tubes leave the small forked bladder at the anterior cornua, and divide into antero-lateral and postero-lateral branches behind the level of the ventral sucker. Each branch bears two flame-cells (fig. 1). In the fully excysted metacercaria or very young fluke the bladder proper assumes a definitely more V-shaped form. Each main collecting-tube becomes greatly elongated, and is thrown into a small round mass of compact coils which partially conceals the main division (fig. 2). Subdivision of the four flame-cells now occurs forming the pattern :—

$$2[(2+2)+(2+2)]=16.$$

The two flame-cells in the œsophageal region point posteriad. Both pairs in the region of the intestinal œsca and ventral sucker point laterad, two to the right, and two to the left. Their capillaries are considerably shorter than those of the other flame-cells. The pair situated alongside the testes point anteriad.

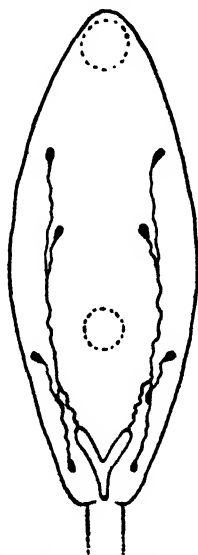
A precise count of the flame-cells in the gravid fluke was not made.

From the above description it will be seen that the main plan of the excretory system of *Maritrema* is the

* A more detailed account of this life-history, with a description of this new species, is appearing elsewhere.

same as that of the allied genera *Microphallus* Ward, 1901, *Levinseniella* Stiles & Hassall, 1901, and *Spelotrema* Jägerskiöld, 1901. The flame-cell pattern agrees with that of *Microphallus opacus* (Ward, 1894) and also *Levinseniella pygmaea* (Levinsen, 1881), if allowances are made for a probable error in the description of the course of the capillaries of two flame-cells in the latter species. The patterns of *Spelotrema*, *Spelophallus* Jägerskiöld, 1908, and *Monocæcum* Staff., 1903, are unknown.

Fig. 1.

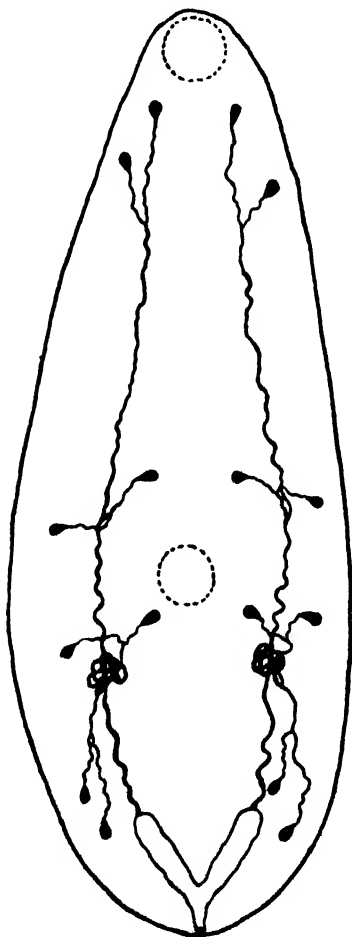
Excretory system of *Cercaria oocysta*.

The systematic position of these genera, grouped together in the subfamily Microphallinae Ward, 1901, has been the subject of much controversy. More light is thrown on this somewhat obscure subject by the recent work on life-histories and the increased knowledge of the morphological details of the excretory system.

Nicoll (1923) placed the Microphallinae in the family Heterophyidae Odner, 1914, and their relationship with this group has been accepted by a large number of authors, including Poche (1926), Fuhrmann (1928), Stunkard (1929), Sprehn (1935), Yamaguti (1935).

Travassos (1920) raised them to the rank of a family, and Faust (1929, 1932) included them as such in his superfamily Heterophyoidea, a classification with which

Fig. 2.



Excretory system of the immature fluke of *Cercaria occysta*.

Ciurea (1933) agrees. Viana (1924), and Van Cleave and Mueller (1932, 1934) also accord them family rank. The latter authors, together with Witenberg (1929), definitely

exclude them from the Heterophyidæ, basing their conclusions on the morphology of the reproductive organs. Vogel (1934) also disregards the classification of Faust and Ciurea and does not include them in his superfamily Opisthorchioidea, which accommodates the Heterophyidæ and Opisthorchidæ Lühe, 1901. A comparison of the life-histories and larval stages of these two groups strongly supports the view that the Opisthorchioidea and Microphallinæ are in no way related.

Sewell (1922) originally called attention to the two distinct types of excretory system, the "*Stenostoma*" type and the "*Mesostoma*" type, found in the Monostome cercariæ. From this evidence he tentatively suggested a double origin of the Trematoda from Rhabdocœle Turbellarians. Dubois (1929)* affirmed this view in a much more definite and general manner. He pointed out that with certain exceptions all cercariæ can be divided into these two groups. Those possessing the "*Stenostoma*" type of excretory system (in which the main collecting-tubes grow forward to the œsophageal region before turning posteriad and dividing) develop in rediæ derived from a miracidium with one pair of flame-cells. Those possessing the "*Mesostoma*" type of excretory system (in which the main collecting-tubes divide into an antero-lateral and postero-lateral branch in the region of the ventral sucker) develop in sporocysts derived from a miracidium with two pairs of flame-cells. To the former belong the Echinostome, *Gymnocephalus*, Amphistome, and most Monostome Cercariæ. The latter include the Xiphidiocercariæ and Furcocercous Cercariæ. It will be seen from the following comparison that the Heterophyidæ belong to one of these groups, and the Microphallinæ to the other.

(1) THE MICROPHALLINÆ.

It has already been pointed out that several authors concluded, on morphological grounds, that *Cercaria oocysta* and its allies, including the encysted *C. ligiæ* Lebour, 1914, developed into members of the Microphallinæ. On similar evidence Lebour (1910), having

* Since the publication of this paper, a number of exceptions are recorded, particularly of marine forms.

followed the development of the metacercariæ in *Carcinus mænas* L., and *Cancer pagurus* L., suggested that the cercariæ of the "Ubiquita" group* were larval forms of *Spelotrema* Jägerskiöld, 1901. Yamaguti (1935) discovered cysts in *Macrophthalmus dilatatus* de Hann, 1853 (under the rostellum and on the gills), and proved experimentally that they developed into *Levinseniella* † Stiles and Hassal, 1901, and *Spelophallus* Jägerskiöld, 1908. Carrère (1936) discovered a Xiphidiocercaria in *Paludetrina acuta* Drap., 1805, and *Pseudammonicola similis* Drap., 1805, which encysts in "divers crustacea" (*Gammarus locusta* L., *Gammarus pulex* L.), and develops into *Maritrema rhodanicum* Carrère, 1936, in the intestine of *Larus argentatus* var. *melanocephalus* Bruch. It will be noted that some slight variation occurs in the life-history, even within the same genus. As in various other groups there is evidence of a tendency towards suppression of the free-swimming cercarial stage, although all these cercariæ possess tails and are capable of swimming feebly if liberated in the water. In *C. oocysta*, *C. pirum* Lebour, 1907, *C. sinuosa* Sinitzin, 1911, and the undescribed *Cercaria* A. Rothschild, 1936, the tails are shed in the sporocyst, a tailless phase follows, while the penetration-glands and stylet are lost, and the cystogenous cells undergo development, and encystment then ensues. In the case of the cercaria of *Maritrema rhodanicum* and *C. ligiæ* there is a free-swimming stage and encystment in an intermediate host. Perhaps the most interesting condition is met with in *Cercaria dimorpha* Sinitzin, 1911. Here two morphologically distinguishable forms develop within the same parthenita: (A) A small form (*Prodroma*) with an unarmed cuticle, which leaves the snail host and whose subsequent fate is unknown; (B) A large form (*Postera*) with a spined cuticle, which sheds the tail and encysts within the sporocyst.

The cercariæ of the Microphallinae, which parasitize Gastropod Molluscs and develop in oval colourless sporocysts, are Xiphidiocercariæ (Lühe, 1909). The body is

* Lebour described several species under the specific name "Ubiquita."

† I have rejected the accounts of Villot (1878) and Gläding (1935) of the life-history of *Levinseniella*. They are, I think, based on errors of observation.

roughly oval and slightly longer than the tail. The stylet is simple. The oral sucker, which is subterminal and well developed, leads into a pharynx, followed by an œsophagus and forked intestine. The ventral sucker is placed slightly behind the centre line of the body, and is smaller and less well developed than the oral sucker. (Lebour failed to discover it in *C. oocysta*). Paired penetration-glands are situated in front of and slightly to the side of the acetabulum. The arrangement and number of these glands and their ducts varies specifically. The cuticle is smooth or armed—the degree of development of the spines at the cercarial stage varying enormously. A small forked bladder, which can be equally well described as V- or Y-shaped according to the state of contraction of the body, is placed at the posterior end of the body. As already noted, the excretory system is of the *Mesostoma* type.

Carrère (1936) has stated that the cercaria of *Maritrema rhodanicum* belongs to the subgroup *Armatae*. The bladder and other structures, however, of related species of *Maritrema* are definitely not of this type. Cercariæ of the subgroup *Armatae* develop into members of the possibly related family Plagiorchidæ Lühe, 1901 (Joyeux & Baer, 1927, Szidat, 1931).

It should be recalled that in the "*Ubiquita*" group the acetabulum does not develop until after encystment, and until this stage is reached the intestine is also difficult to trace.

The cyst is somewhat variable. In shape it may be spherical or elliptical, and there also appears to be some difference in the thickness of the outer and inner layers. The position of the encysted metacercaria is also said to vary specifically (Sinitzin, 1911). The cercariæ of the genus *Microphallus* are unknown, but the metacercariæ of four species, *M. opacus* Ward, 1894, *M. japonicus* Osborn, 1919, *M. ovatus* Osborn, 1919, and *M. minus* Ochi, 1928, have been described. These all encyst in crustacea, *Cambarus* sp., *Macrobrachium nipponensis* de Haan, 1849, etc. The life-history of *Monocæcum baryurum* Stafford, 1903, is unknown. Stafford, however, found the remains of a Crayfish in the stomach of the host *Necturus maculatus* Raf., 1819, and suggests that the

second intermediate host is in all probability also a crustacean.

The final host is a mammal, bird, reptile, or fish. The location of the mature worm is the intestine.

(2) *HETEROPHYIDÆ* AND *OPISTHORCHIDÆ*.

Thanks to the brilliant studies of Stunkard (1930) and Vogel (1934), the life-histories of members of the Heterophyidæ and Opisthorchidæ are well known. For a historical survey, and greater detail, these authors should be consulted. Perhaps the most interesting feature of the life-cycles of these two families is the remarkable morphological similarity found in all the known species of these highly specialized cercariæ. Faust was under the erroneous impression that all the Trematodes included in his superfamily Heterophyoidea possessed larvæ of this type.

The Cercariæ which parasitize Gastropod Molluscs are Pleurolophocercous Cercariæ (Sewell, 1922). They develop in typical rediæ possessing a pharynx, intestine, and birth-pore.

The body of the cercaria is pear-shaped. Two well-developed eye-spots are situated in the pharyngeal region. The anterior sucker is modified to form a protrusible organ of penetration. The alimentary canal, apart from the pharynx, is not discernible at this stage. The acetabulum is usually undeveloped. A number of penetration-glands are present above the acetabular region. Their ducts form four separate bundles, which open on the lip of the oral sucker. The number of ducts per bundle varies specifically. The cuticle is armed or smooth, and there are minute boring spines situated in the mouth of the oral sucker. The large, almost spherical or rectangular bladder is situated posteriorly, and is lined with very large cells. The excretory system is of the "*Stenostoma*" type. The tail is very characteristic, being considerably larger than the body and furnished with dorso-ventral and lateral fin folds.

A fish invariably serves as the second intermediate host. No variation is recorded in cyst-formation. The final host is a mammal, bird, fish, or reptile, and the adult worm is located in the intestine, gall-bladder, or bile-duct.

The comparison may be summarised thus :—

<i>Microphallinae.</i>	<i>Heterophyidae</i> and <i>Opisthorchiidae.</i>
(1) Miracidium ?	(1) Miracidium with one pair of flame-cells.
(2) Development in unbranched sporocysts.	(2) Development in rediae.
(3) Cercariae are Xiphiidiocercariae.	(3) Cercariae are Pleurolophocercous Cercariae.
(4) " <i>Mesostoma</i> " type of excretory system.	(4) " <i>Stenostoma</i> " type of excretory system.
(5) Encystment occurs in the first intermediate host, or in an Arthropod.	(5) Encystment occurs in fish.
(6) Adult in the alimentary canal of mammals, birds, reptiles, and fish.	(6) Adult in the alimentary canal, gall-bladder, and bile-ducts of mammals, birds, reptiles, and fish.

On similar grounds, namely, the morphology of the excretory system, the morphology of the larval forms and the life-cycle, the *Gymnophallinae* Odhner, 1904, cannot be included in the same family as the *Microphallinae*, although they are probably more nearly related to each other than to the *Opisthorchioidea*.

Where, then, are the *Microphallinae* to be placed in a general scheme of classification? The genera *Microphallus*, *Maritrema*, *Spelophallus*, *Spelotrema*, *Levinsoniella*, and *Monocæcum* seem to form a distinct and closely related group. The subfamily should be raised to the rank of family, as suggested by various authors (see above), the definition of which should include the following additions:—Excretory system of the "*Mesostoma*" type, with flame-cell pattern $2[(2+2)+(2+2)]=16$. Cercariae are Xiphiidiocercariae which encyst in the first intermediate host, or in an Arthropod.

Various authors, including Faust (1929), have from time to time included the *Lecithodendriidae* Odhner, 1910, in a superfamily with the *Heterophyidae*, but this relationship has been denied by many others, including Brown (1933), who compared their excretory systems. The larval forms of members of both the *Lecithodendriinae* Looss, 1896 (Brown, 1933), and *Pleurogenetinae* Looss, 1899 (MacMullen, 1936), are now known. The cercariae (including the morphology of the excretory system) and the metacercariae greatly resemble those of *Maritrema*. The life-cycle is also similar. The cercariae encyst in

arthropods (insect larvæ), and a free tailless phase occurs in the second intermediate host before encystment. In the case of the life-cycle of *Mosesia chordeilesia* McMullen, 1935 (McMullen, 1936), this resemblance is displayed in a most striking manner. The members of the Lecithodendriidæ (as revised by Srivastava, 1934) show considerable variation, particularly with regard to the position of the reproductive organs, and consequently do not present such a homogeneous group as the Microphallidæ. However, they differ from the latter in only one very important character, namely, the possession of a small receptaculum seminis. When the morphology of other organs, particularly the excretory system, is taken into consideration, together with the larval stages and the life-cycle, these seem insufficient grounds upon which to deny a natural relationship between the two families.

Mehra (1935) places the Lecithodendriidæ provisionally in Faust's superfamily Dicrocoelioides, for, as he suggests, a relationship very probably exists between them and the Dicrocoelidæ Looss, 1907, and Plagiorchidæ. Without, however, a more definite knowledge of various life-cycles the erection of superfamilies such as this must to a large degree be a matter of speculation. As Mehra has pointed out, at the present moment no useful purpose can be served in this manner.

REFERENCES.

- BROWN, F. J. 1933. "On the Excretory System and Life-history of *Lecithodendrium chilostomum* (Mehl.) and other Bat Trematodes, with a Note on the Life-history of *Dicrocalium dendriticum* (Rudolphi)." 'Parasitology,' Cambridge, xxv, 1933, pp. 317-328, 1 text-fig., pl. xxi.
- CARRÈRE, P. 1936. "Sur le cycle évolutif d'un *Maritrema* (Trematodes)." C. R. Acad. Sci. Paris, t. 202, no. 3, pp. 244-246.
- CIUREA, I. 1933. "Les vers parasites de l'homme, des mammifères et des oiseaux provenant des poissons du Danube et de la Mer Noire. Premier mémoire. Trématodes, famille Heterophyidæ Odhner, avec un essai de classification des Trématodes de la super-famille." Arch. roumain. Path. exp. Microbiol. Paris, vi, 1933, pp. 1-134, 36 pls.
- DUBOIS, G. 1929. "Les Cercaires de la région de Neuchâtel." Bull. Soc. Neuchâtel. Sci. nat. liii. (n.s. 2), 1928 (1929), pp. 1-177, 17 pls. 8 text-figs.
- FAUST, E. C. 1929. 'Human Helminthology: a Manual for Clinicians, Sanitarists, and Medical Zoologists.' Philadelphia and London, 1929, 616 pp., 297 figs.
- . 1932. "The Excretory System as a Method of Classification of Digenetic Trematodes." Quart. Rev. Biol. Baltimore, vii, pp. 458-466, 22 figs.

- FUHRMANN, O. 1928. "Trematoda. Zweite Klasse des Cladus Plathelminthes." Kükenthal & Krumbach, Handb. Zool. Berlin, ii. (2), 1928, pp. 1-128, 171 figs.
- GLADING, B. 1935. "The Life-cycle of *Cercariae lintoni* Miller & Northrup." J. Parasit. Urbana, xxi. 1935, p. 434.
- JÄGERSKIÖLD, L. A. 1900. "*Levinsenia (Diatomum) pygmaea*, ein genitalnapftragendes Distomum." Zbl. Bakter. xxvii. pp. 732-740, 3 figs.
- . 1908. "Kleine Beiträge zur Kenntnis der Vogeltrematoden." Zbl. Bakter. Jena, xlviii. 1908, pp. 302-317, 7 figs.
- JOYEUX, C., & BAER, J. G. 1927. "Recherches sur le cycle évolutif du Trematode *Opiethioglyphe rastellus* (Olsson, 1876)." Bull. biol. France Belge, lxi. 1927, pp. 359-373, 3 figs. pl. xxii.
- LEBOUR, M. V. 1911. "A Review of the British Marine Cercariae." 'Parasitology,' Cambridge, iv. 1911, pp. 416-456, pls. xxv.-xxix.
- . 1914. "Some Larval Trematodes from Millport." 'Parasitology,' Cambridge, vii. no. 1, pp. 1-11, 1 pl., 1914.
- LÜHE, M. 1909. 'Parasitische Plattwürmer.—I. Trematoda. In: Die Süßwasserfauna Deutschlands,' Heft 19, pp. 173-210, 188 figs.
- McMULLEN, D. B. 1936. "A Note on the Life-history of *Moesia chordeilesia*, sp. n. (Lecithodendriidae)." J. Parasit. Urbana, xxii. no. 3, pp. 297-298, 7 figs.
- MEHRA, H. R. 1935. "New Trematodes of the Family Lecithodendriidae Odhner, 1911, with a Discussion on the Classification of the Family." Proc. Acad. Sc. Allahabad, v. 1935, pp. 99-121, 3 figs.
- NICOLL, W. 1907. "Observations on the Trematode Parasites of British Birds." Ann. & Mag. Nat. Hist. ser. 7, xx. 1907, pp. 245-271.
- . 1909. "Studies on the Structure and Classification of the Digenetic Trematodes." Quart J. Micr. Sci. London, liii. 1909, pp. 391-487, pls. ix.-x.
- . 1923. "A Reference List of the Trematode Parasites of British Birds." 'Parasitology,' Cambridge, xv. 1923, pp. 151-202.
- OCHI, S. 1928. "On a new Trematode *Microphallus minus*, sp. n., having *Macrobrachium nipponense* as its Intermediate Host." Tokyo Iji Shinshi, 1928, no. 2578, pp. 4-12, Abst. in Japan J. Zool. Tokyo, ii. 1928, p. 1.
- OSBORN, H. L. 1919. "Observations on *Microphallus ovatus*, sp. n., from the Crayfish and Black Baas of Lake Chautauqua, N.Y." J. Parasit. Urbana, v. 1919, pp. 123-127, pl. x.
- POCHE, F. 1926. "Das System der Platyodaria." Arch. Naturgesch. Berlin, xci. 1925 [1926] A. 2-3, pp. 1-458, pls. i.-vii.
- ROTHSCHILD, M. 1936. "Preliminary Note on the Trematode Parasites of *Peringia ulvae* (Pennant), 1777." Novit. zool. Tring, xxxix. pp. 268-269, 1936.
- SEWELL, R. S. 1922. "*Cercariae indicæ*." Ind. J. med. Res. x. (suppl. no.), 1922, pp. 1-370, i-iii, and 32-, 7 pls.
- SINITZIN, D. T. 1911. "Parthanogenetic Generation of Trematodes and its Progeny in the Molluscs of the Black Sea." Mém. Acad. Sci. St. Petersb. (8) xxx. pp. 1-127. (Unpublished translation.)
- SPREHN, C. 1932. 'Lehrbuch der Helminthologie. Eine Naturgeschichte der in deutschen Säugetieren und Vögeln schmarotzenden Würmer unter besonderer Berücksichtigung der Helminthen des Menschen, der Haustiere und wichtigsten Nutztiere.' Berlin, 1932, pp. 998, 374 figs.

- SPREHN, C. 1933. 'Trematoda, in Grimpe & Wagler, Die Tierwelt der Nord u. Ostsee,' Leipzig Lief. 24, Teil 4 c, 1933, pp. 1-60, 20 figs.
- SRIVASTAVA, H. D. 1934. "On new Trematodes of Frogs and Fishes of the United Provinces, India.—Part III. On a new Genus *Mehraorchis* and two new Species of *Pleurogenes* (Pleurogenetinae) with a Systematic Discussion and Revision of the Family Leiothodendriidae." Bull. Acad. Sci. U.P. Allahabad, iii. 1934, pp. 239-256, 1 pl.
- STAFFORD, V. 1903. "Two Distomes from Canadian Urodela." Zbl. Bakter. Jena, xxxiv. pp. 822-830, figs. 1-3, 1 pl.
- STUNKARD, H. W. 1929. "The Excretory System of *Cryptocotyle* (Heterophyidae)." J. Parasit. Urbana, xv. 1929, pp. 259-266, pl. xxii.
- . 1930. "The Life-history of *Cryptocotyle lingua* (Creplin), with Notes on the Physiology of the Metacercariae." J. Morph. Philadelphia, l. 1930, pp. 143-190, pls. i.-iv.
- SZIDAT, L. 1931. "*Cordulia aenea* L., ein neuer Hilfswirt für *Prosthogonimus pellucidus* v. Linatow, den Erreger der Trematodenkrankheit der Legehühner." Zbl. Bakt. Jena Orig. cxix. 1931, pp. 289-293, 3 figs.
- TRAVASSOS, L. 1920. "Contribuição para conhecimento da fauna helmintologica Brasileira.—IX. Sobre as especies da subfamilia Microphallinae Ward, 1901." Arch. Esq. Sup. Agr. & Med. Vet. iv. no. 2, 1920, pp. 85-91, pls. xxi.-xxv.
- VAN CLEAVE, H. J., & MUELLER, J. F. 1932. "Parasites of Oneida Lake Fishes.—Part II. Descriptions of new Species and some General Taxonomic Considerations, especially concerning the Trematode Family Heterophyidae." Roosevelt, Wild Life Ann. Syracuse, iii. 1932, pp. 79-137, 25 pls.
- . 1934. "Parasites of Oneida Lake Fishes.—Part III. A Biological and Ecological Survey of the Worm Parasites." Roosevelt, Wild Life Ann. Syracuse, iii. 1934, pp. 161-334, 9 figs. pls. xxix.-xl.
- VIANA, L. 1924. "Tentativa de catalogação das especies brasileiras de Trematodeos." Mem. Inst. Osw. Cruz, Rio de J. xvii. 1924, pp. 95-227.
- VILLOT, A. 1878. "Organisation et développement de quelques espèces des Trematodes endoparasites marins (1)." Ann. Sci. nat. Paris, viii. sér. 6, no. 2, pp. 1-40.
- VOGEL, H. 1934. "Der Entwicklungszyklus von *Opisthorchis felinus* (Riv.) nebst Bemerkungen über die Systematik und Epidemiologie." Zoologica Stuttgart, xxxiii. Heft 86, 1934, pp. 1-103, 28 figs., 8 pls.
- WARD, H. B. 1901. "Note on the Parasites of the Lake Fish.—III. On the Structure of the Copulatory Organs in *Microphallus*, nov. gen." Trans. Amer. Micr. Soc. xxii. pp. 175-185, 1 pl.
- WITENBERG, G. 1929. "Studies on the Trematode Family Heterophyidae." Ann. Trop. Med. Parasitol. Liverpool, xxiii. 1929, pp. 181-239, 33 figs.
- WRIGHT, S. 1912. "Notes on the Anatomy of the Trematode, *Microphallus opacus*." Trans. Amer. Micr. Soc. xxxi. 1912, pp. 167-176, 2 pls.
- YAMAGUTI, S. 1934. "Studies on the Helminth Fauna of Japan.—Part 3. Avian Trematodes, II." Japan. J. Zool. Tokyo, v. 1934, pp. 543-583, 16 figs.
- . 1935. "Studies on the Helminth Fauna of Japan.—Part 5. Trematodes of Birds, III." Japan. J. Zool. Tokyo, vi. 1935, pp. 158-182, 17 figs.

XXXI.—*Note on a Collection of Polychæta from South Africa, with the Description of a new Species belonging to the Family Sabellidæ.* By C. C. A. MONRO, Department of Zoology, British Museum (Natural History).

IN the course of the examination of several collections of Polychæta from South Africa, submitted to me by Prof. T. A. Stephenson of the University of Capetown in connection with his work on an ecological survey of the marine fauna of South Africa, I have met with several new records for this area. These are (Family Chætopteridæ) *Mesochætopterus minutus* Potts, Isipingo Beach, Durban; (Family Cirratulidæ) *Dodecaceria fistulicola* Ehlers, Hotel Rocks, Port Nolloth, St. James, and Glencairn; (Family Serpulidæ) *Protula bispiralis* (Savigny), St. James; and (Family Sabellidæ) *Potamilla ehlersi* Gravier, Isipingo Beach, Durban. There is also another small Sabellid, of which the description follows:—

Genus ORIDIA Rioja.

Oridia capensis, sp. n.

Occurrence.—St. James (numerous); Humewood Beach, Port Elizabeth (numerous).

Description.—There are two dense clusters of innumerable, fine, sandy tubes. The individual tubes measure 50–60 mm. in length by about 1 mm. in breadth, and are closely covered with fine grains of sand. It is very difficult to extract an intact specimen from the tubes, for the gill plume is nearly always left behind. The specimens measure about 10 by 0.3 mm.; the number of chætigers is constantly 11, of which the first 8 are thoracic. The body is unusually elongate and slender for a Sabellid, each segment being very long relatively to its breadth. The body is more or less circular in section, and the diameter is fairly constant throughout the whole length. The gills are pale green; there is a reticular pattern of black pigment over the collar and the first two or three segments, and behind these the body-colour is pale green.

There are three pairs of adherent gills. Each gill (fig. 1) has a number of long slender barbules that cease abruptly about halfway up the rachis, which is itself almost as slender as the barbules. I see no palmar membrane. Within the gill-plume there is a pair of dark-coloured, basally expanded, cirriform processes, which I take to be palps.

The collar (figs. 2 & 3) runs right round the body at the same height. It is separated by notches on each side from a pair of finger-shaped lobes that arise in the mid-dorsal line just beyond the end of the faecal groove. Otherwise it is entire.

The first segment carries a pair of eyes. After clearing in creosote I have failed to find any otoliths in the first chætiger. Moreover, glandular pads are not apparent, either in thorax or abdomen.

The thoracic bristles (fig. 4) are all of the same kind. They are simple bordered capillaries; and the thoracic hooks (fig. 5) have long manubria and a cap of denticles above the main fang. The abdominal bristles (fig. 6) appear to be simple very narrowly bordered capillaries, geniculate near the base and twisted distally. The abdominal hooks (fig. 7) are square at the base, have a neck and a face carrying a series of rows of minute denticles.

The pygidium (fig. 8) is tapered and carries a pair of eyes.

Remarks.—This is the only species of *Oridia* that builds colonies of apparently permanent sandy tubes, though it is not yet known to what extent it vacates the tubes to swim or crawl freely. Incubation appears to take place inside the tubes, for from one tube I removed two post-larval specimens loosely and probably accidentally adhering to the adult. The South African *O. parvula* of Ehlers (1913, p. 582) and Augener (1918, p. 586) is a much smaller species measuring c. 2 mm. for 14–18 chætigers. It has a collar widely open dorsally, and prolonged and incised in the mid-ventral line. Also it has no anal eyes. *O. eimeri* (Langerhans, 1880, p. 117) measures only 1 mm. in length and has a crenate collar widely open dorsally. The northern *O. armandi* and the southern *O. limbata* both differ from *O. capensis*

Fig. 1.



Fig. 2.



Fig. 3.

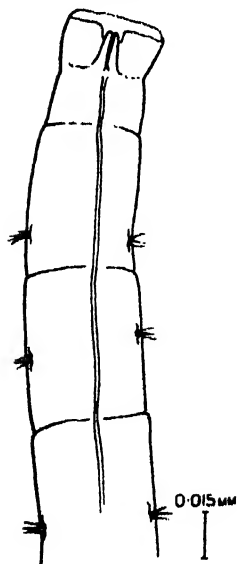
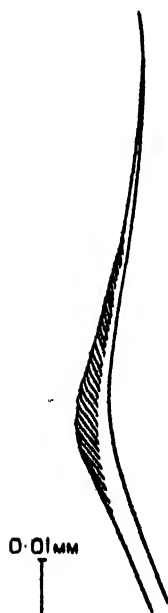


Fig. 4.



Oridia capensis, sp. n.

Fig. 1.—Gill.

Fig. 2.—Head end from above.

Fig. 3.—Dorsal view of anterior end. Gills removed.

Fig. 4.—Thoracic bristle.

Fig. 5.

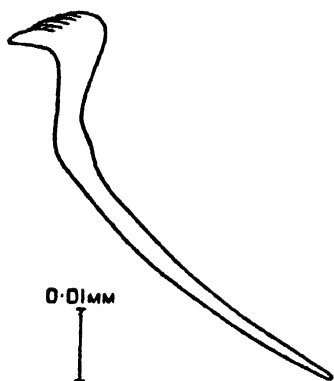


Fig. 6.



Fig. 7.

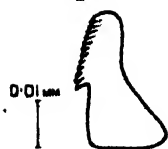
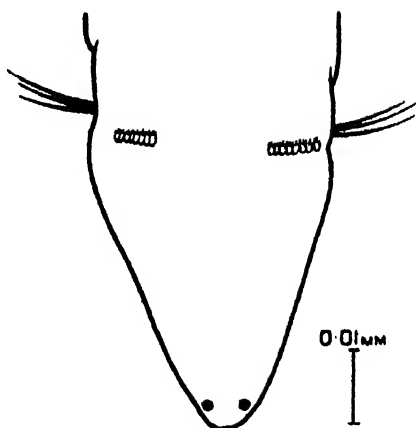


Fig. 8.



Oridia capensis, sp. n.

- Fig. 5.—Thoracic hook.
Fig. 6.—Abdominal bristle.
Fig. 7.—Abdominal hook.
Fig. 8.—Pygidium.

in the less elongate shape of the body, in the structure of the collar and of the abdominal hooks.

REFERENCES.

- AUGENER, H. 1918. "Polychæta. Beiträge zur Kenntniss des Meeresfaunas West-Afrikas." Herausgeg. v. W. Michaelsen, ii. (2) pp. 67-625, pls. ii.-vii. Hamburg.
 EHLERS, E. 1913. "Die Polychæten-Samenlungen d. D. Südpolarexped. xiii. (4) pp. 397-598, 21 pls.
 LANGERHANS, P. 1880. "Die Wurmfauna von Madeira. —III." Z. wiss. Zool. xxxiv pp. 87-143, pls. iv.-vi.

XXXII.—*A brief Survey of the Species of Mallophaga described from (1) Anseriformes and Ciconiiformes (Phænicopteri).* By GORDON B. THOMPSON, Department of Entomology, British Museum (Natural History).

PETERS (1931), in the first volume of his 'Check-List of Birds of the World,' lists sixty-three genera of Anseriformes. From thirty-three of these no species of Mallophaga has been described. In the table given below the distribution is shown of the various genera of Mallophaga throughout the thirty-three genera of Anseriformes from which they have been described, but records other than the type-hosts of the species described to date are disregarded.

Of the Mallophagan genera in the table *Acidoproctus*, *Ornithobius*, *Bothriometopus*, and *Heteroproctus* are entirely confined to the Anseriformes. The genus *Heteroproctus* is monotypic, *Bothriometopus* contains two species, and the remainder of the above genera contain more than three species each. The genera *Trinoton*, *Anataecus*, and *Anaticola*, as far as is known, occur only on the Anseriformes, except for a single species in each genus which occurs on species of Ciconiiformes, i. e., *Phænicopterus antiquorum* Temminck and *P. ruber* Linné. The genus *Eulæmobothrion* seems to be confined to aquatic and semi-aquatic birds. The genera *Menopon*, *Colpocephalum*, and *Philopterus* in their present status contain a large number of species occurring on a very wide range of hosts.

I have included the genus *Phœnicopterus*, the only genus of the family Phœnicopteridæ (of the Ciconiiformes) from which Mallophaga have been described, as they seem to be intimately bound up with the Anseriiformes.

Genera of Anseriiformes.	<i>Menopon.</i>	<i>Colpocephalum.</i>	<i>Trinoton.</i>	<i>Eulenobothrion.</i>	<i>Philopterus.</i>	<i>Anatecus.</i>	<i>Acidoproctus.</i>	<i>Ornithobius.</i>	<i>Bothriomictopus.</i>	<i>Heteroproctus.</i>	<i>Anaticola.</i>
<i>Anhima</i>	—	—	—	—	—	—	—	—	×	—	—
<i>Chauna</i>	—	×	—	—	—	—	—	—	×	—	—
<i>Cygnus</i>	×	×	×	—	—	×	—	×	—	—	×
<i>Chenopsis</i>	—	×	×	—	—	—	—	×	—	—	×
<i>Anseranas</i>	—	—	—	—	—	—	—	—	—	×	—
<i>Plectropterus</i> ..	×	—	—	—	—	—	—	—	—	—	×
<i>Cereopsis</i>	—	—	—	—	—	—	—	—	—	—	×
<i>Anser</i>	×	×	×	×	—	×	—	×	—	—	×
<i>Cygnopsis</i>	—	—	—	—	—	×	—	—	—	—	×
<i>Branta</i>	—	—	—	—	×	×	—	×	—	—	×
<i>Chloephaga</i>	—	—	—	—	—	—	—	—	—	—	×
<i>Dendrocygna</i> ..	—	—	×	—	—	—	×	—	—	—	—
<i>Alopochen</i>	—	×	—	—	—	—	×	—	—	—	×
<i>Sarkidiornis</i> ..	—	—	—	—	—	—	—	—	—	—	×
<i>Cairina</i>	—	—	—	—	—	—	×	—	—	—	×
<i>Tadorna</i>	×	×	×	—	—	—	—	—	—	—	×
<i>Anas</i>	×	—	×	—	—	×	—	—	—	—	×
<i>Mareca</i>	—	—	×	—	—	—	—	—	—	—	×
<i>Chaulelasmus</i> ..	—	—	—	—	—	—	—	—	—	—	×
<i>Spatula</i>	—	—	—	—	—	×	—	—	—	—	×
<i>Aix</i>	—	—	—	—	—	—	—	—	—	—	×
<i>Netta</i>	—	—	—	—	—	×	×	—	—	—	—
<i>Nyroca</i>	—	—	—	—	—	×	×	—	—	—	×
<i>Tachyeres</i>	—	—	—	—	—	—	—	—	—	—	×
<i>Bucosphala</i>	—	—	×	—	—	—	—	—	—	—	—
<i>Somateria</i>	—	—	—	—	—	—	—	—	—	—	×
<i>Oidemia</i>	×	—	—	—	—	—	—	—	—	—	×
<i>Melanitta</i>	×	—	—	—	—	—	—	—	—	—	×
<i>Mergellus</i>	—	—	×	—	—	×	—	—	—	—	—
<i>Mergus</i>	—	—	—	—	×	×	—	—	—	—	×
Genus of Ciconiiformes.											
<i>Phœnicopterus</i> ..	—	×	×	—	—	×	—	—	—	—	×

XXXIII.—*A new Genus belonging to the Subfamily Platygasterinæ (Hym., Proctotrupoidea)*. By G. E. J. NIXON, B.A., Department of Entomology, British Museum of Natural History.

THE genus described below is of particular interest from a biological point of view. The members of the subfamily of the Proctotrupoidea, to which it belongs, *i. e.*, the Platygasterinæ, are, so far as I am aware, exclusively parasites of Cecidomyid flies; but it seems quite certain from the careful observations of its collector, Mr. J. N. Halbert, that at least the species described first is a parasite of the eggs of a Longicorn beetle. The second species was bred in association with beetles of the family Scolytidæ, but it does not seem to be proven that they were the actual host of the parasite.

PLATYSTASIUS, gen. nov.

Head strongly transverse. Antennæ 10-segmented in both sexes. Eyes completely bare. Posterior ocelli much nearer to the eye-margin than to each other. *Thorax* strongly flattened dorso-ventrally. Parapsidal furrows showing as clearly defined, fine grooves which are widely separated and more or less parallel to each other. Scutellum almost flat. Fore wings typical of the Inostemmini, having a clearly defined subcostal vein which is dilated at its apex. *Abdomen* wider than the thorax, strongly flattened dorso-ventrally, with six segments in the ♀. Tergite 1 simple in the ♀, showing no trace of a protuberance at its base.

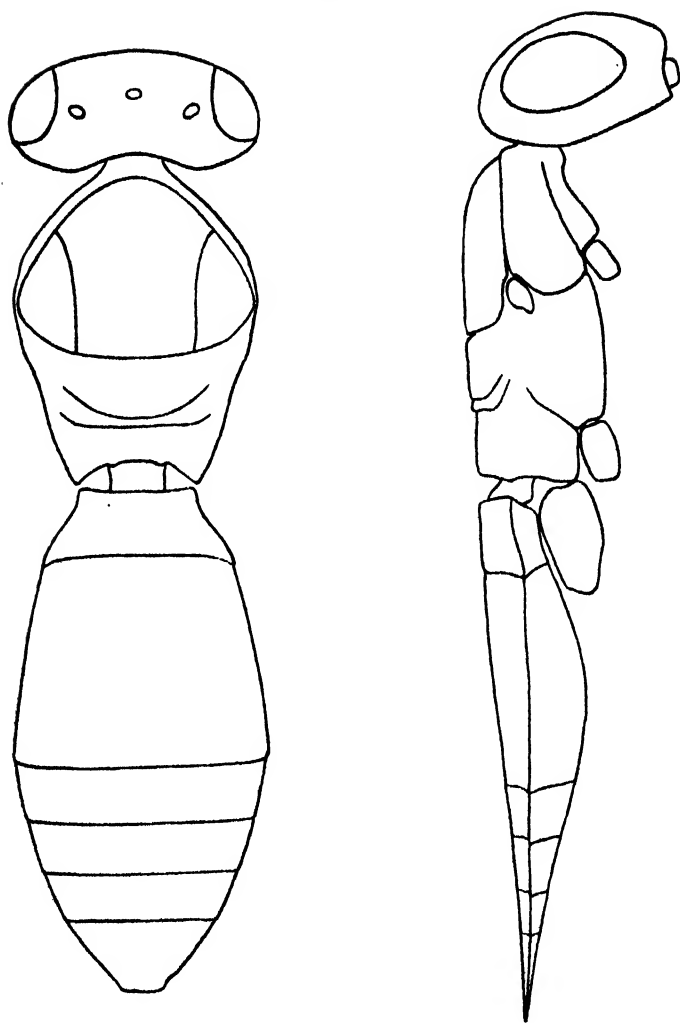
Type of the genus, the following species :—

Platystasius strangaliophagus, sp. n. (Fig. 1.)

♀. Brownish black. Antennæ dark brown, with the base of the scape, the pedicel, and sometimes the basal segments of the funicle paler. Legs brown; all the tarsi and base of all the tibiæ (sometimes anterior tibiæ entirely) yellowish.

Head seen from in front wider than long, about 10 : 7, evenly elliptical; further, it is very slightly narrower than the thorax, and, seen from above along a line perpendicular to a line between the posterior ocelli, is nearly

Fig. 1.



Platygasterius strampaliochagus, sp. n., ♀.

two and a half times as wide as its shortest length ; seen from the side it appears somewhat flattened. Frons without a trace of an impression above the antennal insertions, feebly shining, and with only microscopically fine, vague sculpture which is strongest towards the antennal insertions and along the inner eye-margin. Antennæ : scape strongly thickened towards the apex, where it is nearly twice as wide as the pedicel ; scape, further, fully twice as long as its apical width ; funicle segments 3-5, strongly transverse, much narrower on the outer side than on the inner ; last three segments of funicle forming a thick and *completely differentiated* club, the first segment of which is slightly longer than the following.

Thorax : mesonotum slightly depressed posteriorly, almost smooth, but towards the front with some very weak scaly reticulation ($\times 60$). Hairs of the mesonotum very short, adpressed, and widely separated. Scutellum entirely smooth, at least over its greater medial part. Propodeum with the usual two carinæ, which, owing to the flattening of the thorax, are almost horizontally placed. Fore wings faintly brownish.

Abdomen a little wider than the thorax, less than twice as long as wide, about 28 : 15, conspicuously flattened, especially beyond tergite 2 ; tergite 1 about two and a half times as wide apically as its medial length, longitudinally striated, and with two basal lateral depressions ; 2 slightly shorter than its apical width, about 4 : 5, and more or less equal to the following tergites together ; at each side basally tergite 2 has two short depressions, from which fine striations diverge, the longest of these striations extending slightly beyond the middle of the tergite, which otherwise is entirely smooth ; following tergites (but 3 almost smooth) with some extremely faint scaly-reticulate sculpture ; tergite 6 large, subtriangular, its base about twice as wide as its length, its apex somewhat truncated, and its apical margin much less strongly chitinized than elsewhere.

Length 2.1 mm. approx.

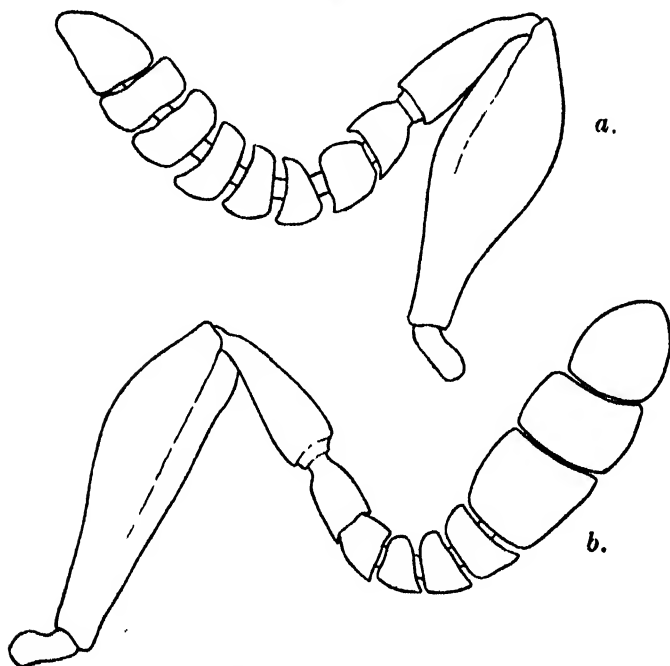
Type in B.M.

IRELAND : Co. Cork, Glengarriff (*J. N. Halbert*) : 2 ♀♀, bred 7. vii. 1925 from eggs of *Strangalia aurulenta* F., a Longicorn beetle ; the eggs were found under bark during July of the previous year.

Platystasius othus, sp. n. (Fig. 2.)

♀. Differs from the preceding species as follows:—Segments 3–5 of the funicle slightly less transverse (fig. 2 *b*). *Abdomen* slightly larger in proportion to the size of the thorax; tergite 1 more transverse, almost three times as wide apically as long, somewhat swollen

Fig. 2.

Antennæ of *Platystasius othus*, sp. n. a, ♂; b, ♀.

in the middle, and with its striations less strong; 2 much shorter, quite obviously transverse, about 11 : 7, its lateral striations occupying a relatively shorter and wider area; anteriorly the striations fade into a very feeble striate-reticulate sculpture which extends to the apex of the segment laterally; further, tergite 2 is hardly more than half the length of the following tergites together; 3–6 evenly and more distinctly sculptured, but the sculpture essentially like that of the preceding species; 6 slightly less transverse and more pointed apically.

♂. Head less transverse than in the ♀. Funicle of the antennæ gradually thickened from base to apex (fig. 2 a); segment 2 slightly produced beneath at apex; 5-7 markedly transverse. Abdomen reddish brown and contrasting quite strongly with the more or less black thorax, considerably less elongate than in the ♀, about 24 : 15; tergites 3-6 less clearly sculptured, nearly smooth.

Type in B.M.

ITALY : Portici (*Dr. G. Russo*); 1 ♂, 2 ♀♀, 30. viii. 1935, supposed to have been bred from a species of Scolytid beetle on olive-trees.

I have described this species at the request of Dr. Ch. Ferrière, of the Imperial Institute of Entomology, who handed me the material for examination.

In Kieffer, 'Das Tierreich,' Lief. 48, these two species, which show an obvious and close relationship with each other, run to *Isostasius* Först., but cannot be placed within this genus. *Isostasius* has the posterior ocelli widely distant from the eye-margin and the scutellum strongly arched, cushion-shaped. According to Kieffer tergite 2 in European *Isostasius* is very large and occupies nearly the whole dorsal surface of the abdomen. In *Platystasius* the 3-segmented club of the antenna of the ♀ is probably generic; *Isostasius* has it 4-segmented according to Kieffer. In general facies, too, there is a great difference between the two genera, *Isostasius* not having the thorax and abdomen in the least flattened.

A comparison with the other genera placed by Kieffer within the group Inostemmini seems to establish *Platystasius* beyond doubt as a new genus.

XXXIV.—*Mantodea* from the Lake Rudolf Rift Valley Expedition, 1934. By M. BEIER, Vienna.

THIS interesting small collection, which I have received for study from the British Museum, contains the following species :—

Eremiaphila cordofana Werner.

1 ♂, 2 ♀♀, Uganda, Turkana Prov., Kabua, 7-8. v. 1934.

The specimens in question seem in all probability to belong to this species, till now known only from one

female larva from Kordofan. I have the following to add to the description of Werner :—

♂. Sides of pronotum towards the posterior angles somewhat emarginate, and the angles therefore a little prominent. Distal outer spine of anterior femora strongly enlarged. Middle abdominal tergites each with a small, but distinct, median tooth. Subgenital plate emarginate apically. Coloration as in the female; hind wings with a large black spot leaving the apex free.

♀. Head large, frontal scutellum broader than high, on each side under the base of the antennæ flat, emarginated. Pronotum quadratic, with blunt anterior and pointed posterior edges, the front margin before the first ones flat, emarginated. The disk of the pronotum before the hind margin on each side of the middle line with a strong and high elevated tubercle (stronger than in the type), the tubercles near the front margin only very flat (*i. e.*, as in the type not very pronounced). Tegmina one-coloured. Wings with a black spot at the top. The fore coxæ black except the fore margin. The fore femora one-coloured. The middle and hind femora and tibiæ with dark rings. Metatarsus of the hind legs as long as the following joints together. The last abdominal tergites with a small triangular flap in the middle of the hind margin as a keel-like continuation of the median line.

Length of body, ♂ 16, ♀ 20; length of pronotum, ♂ 3.5, ♀ 4; width of pronotum, ♂ 3.5, ♀ 4.5; elytra, ♂ 5, ♀ 6; posterior femur, ♂♀, 10; posterior tibia, ♂♀, 11 mm.

Elæa marchali (Cocq.).

6 ♂♂, 2 ♀♀, Uganda, Turkana Prov., Lokitang, iii. 1934.

Charieis peeli Burr

(=*Oxyelæa heteromorpha* Beier).

2 ♂♂, Turkana Prov., Lodwar, 2. v. 1934, and Kakuma, 7. v. 1934.

Tarachodes alluaudi Chop. (var. *minor* Chop.).

4 ♂♂, 1 ♀, Turkana Prov., Lokitang, iii. 1934.

Apparently belong to this species. Vertex very nearly convex. Frontal scutellum with a black fascia; another sharply defined black fascia at the base of antennæ;

378 *On Mantodea from the Lake Rudolf Rift Valley.*

both fasciæ extend on to the eyes. Pronotum somewhat more slender than in *karschii* Werner, but otherwise as in that species. Elytra almost as long as pronotum, blackened apically. Length of body, ♀, 37; length of pronotum 9·5; width of pronotum 4·5; elytra 9 mm.

Galepsus intermedius Werner.

1 ♂, Turkana Prov., v. 1934.

Tarachina raphidioides Werner.

2 ♂♂, Turkana Prov., v. 1934.

Hoplocorypha lacualis G.-Tos.

1 ♀, 1 ♀ larva, Turkana Prov., v. 1934.

Oxyothespis parva, sp. n.

1 ♂, Turkana Prov., v. 1934 (*D. Buxton*).

Head about twice as broad as long. Eyes strongly projecting sideways, with a fairly long blunt apical spine. Pronotum relatively short, smooth; its sides scarcely denticulate; median keel of metazona fine, smooth. Elytra hyaline, only the costal area with a brown longitudinal stripe; discoidal area and its veins without spots. Wings hyaline, not spotted. Anterior coxæ longer than half the pronotum. Anterior tibiæ with eight external spines. (End of abdomen broken off.)—Length of body ?; length of pronotum 7; length of metazona 5; width of pronotum 1·2; elytra 14; anterior coxæ 3·5; posterior femora 7·5 mm. Type in the British Museum (Natural History).

Most closely allied to *O. brevicollis* Beier, but differing from it by more strongly projecting eyes, by shorter elytra, which are not spotted in the discoidal area, by the presence of a brown longitudinal stripe in the costal area of elytra, as well as by the relatively shorter anterior coxæ and posterior femora.

Parasphendale minor Schult.-Schindl.

2 ♂♂, Turkana Prov., v. 1934.

Miomantis paykullii Stål.

2 ♂♂, Turkana Prov., v. 1934.

Tenodera superstitiosa (F.).

1 ♂, Uganda, Turkana Prov.

Hierodula (Sphodromantis) viridis (Forsk.).

1 ♂, Uganda, Turkana Prov.

Ischnomantis spinigera Schulthess-Schindler.

2 ♂♂, 1 larva, Uganda, Turkana Prov., v. 1934.

Ischnomantis spec.

1 larva, Turkana Prov., v. 1934.

Catasigerpes niloticus G.-Tos.

3 ♂♂, Turkana Prov., v. 1934.

Popa undata (F.).

2 ♂♂, Uganda, Turkana Prov.

XXXV.—A brief Survey of the Species of Mallophaga described from (2) Falconiformes. By GORDON B. THOMPSON, Department of Entomology, British Museum (Natural History).

Of the eighty-nine genera of Falconiformes listed by Peters (1931) in the first volume of his 'Check-List of Birds of the World' no species of Mallophaga has been described from fifty-seven of them. As in a previous paper (Thompson, 1937) the distribution of the various genera of Mallophaga is shown throughout the thirty-two genera of Falconiformes from which they have been described. Here again records other than the type-hosts of the species of Mallophaga described to date are disregarded.

Regarding the Mallophagan genera in the table below, *Falcolipeurus*, *Læmobothrion*, and *Kurodai* are entirely confined to the Falconiformes. The genus *Kurodai* appears to be monotypic, *Falcolipeurus* and *Læmobothrion* contain a fair number of species. The genus *Degeeriella* in its present form contains a very large number of species occurring on various groups of birds, and is badly in need of revision, but as the genotype is a species described from *Haliæetus albicilla* (Linné) it is obvious that whatever subtractions are made it will ultimately prove to be a genus confined entirely to the Falconiformes. The genera *Menopon* and *Philo-*

pterus in their present status also contain a large number of species occurring on a wide range of hosts. In the case of the genus *Colpocephalum* a division has been made by the erection of the genus *Neocolpocephalum* (= *Ferrisia*) to contain species described from Falconiformes, Columbiformes, and Procellariiformes; but as it seems to me that this is badly in need of revision, I have here treated all the species as belonging to the old genus *Colpocephalum*.

Genera of Falconiformes.	Genera of Mallophaga.						
	<i>Menopon.</i>	<i>Kurodai.</i>	<i>Colpocephalum.</i>	<i>Lernobothrium.</i>	<i>Philopterus.</i>	<i>Degeeriella.</i>	<i>Falcoipeurus.</i>
<i>Vultur</i>	x	—	x	—	—	x	x
<i>Sarcoramphus</i>	x	—	x	x	x	—	x
<i>Oathartes</i>	x	—	x	—	—	—	x
<i>Sagittarius</i>	—	—	x	—	—	—	x
<i>Elanus</i>	x	—	x	—	—	—	—
<i>Pernis</i>	—	—	—	—	—	x	—
<i>Harpagus</i>	—	—	—	—	x	—	—
<i>Helicolestes</i>	—	—	—	—	x	—	x
<i>Milvus</i>	—	—	x	x	x	x	—
<i>Haliaastur</i>	—	—	—	—	x	—	—
<i>Accipiter</i>	x	—	—	—	x	x	—
<i>Geranoaetus</i>	—	—	—	—	—	x	—
<i>Buteo</i>	x	—	x	x	x	x	—
<i>Leucopternis</i>	—	—	—	—	x	—	—
<i>Spizaetus</i>	—	—	x	—	—	—	x
<i>Aquila</i>	—	—	x	—	x	—	x
<i>Halimetus</i>	—	—	x	x	x	x	x
<i>Aegyptus</i>	—	—	—	—	x	—	x
<i>Gyps</i>	—	—	x	x	x	—	x
<i>Pseudogyps</i>	—	—	—	x	—	—	x
<i>Neorosyrtes</i>	—	—	x	x	—	—	x
<i>Neophron</i>	x	—	—	x	—	—	x
<i>Gypaetus</i>	—	—	—	—	—	x	x
<i>Circus</i>	—	—	x	x	x	x	—
<i>Terathopus</i>	—	—	x	—	—	—	x
<i>Circætus</i>	—	—	—	x	x	x	—
<i>Pandion</i>	—	x	—	—	—	—	—
<i>Micrastrus</i>	—	—	—	—	x	—	—
<i>Milvago</i>	—	—	x	—	—	—	—
<i>Polyborus</i>	x	—	x	x	—	x	—
<i>Falco</i>	x	—	—	x	—	x	—

XXXVI.—*Fossil Cichlid Fishes of Dr. L. S. B. Leakey's Expedition to Kenya in 1934-5.* By ETHELWYNN TREWAVAS, D.Sc., Assistant Keeper in the British Museum of Natural History.

DR. LEAKEY's expedition obtained a number of fossil remains of Cichlid fishes, which are deposited in the British Museum of Natural History. They were found in lake muds of Lower Pleistocene age at Kanam, Kavirondo Province, a few miles east of Lake Victoria, and they all appear to belong to the single Cichlid species *Tilapia nigra* (Günther), 1894 *, the natural distribution of which today is confined, so far as is known †, to the Athi River System, Kenya. It has recently been introduced into Lakes Naivasha and Bunyoni.

Tilapia nigra is one of the few species of the genus that have more than three spines in the anal fin. It has XVII-XVIII 10-12 dorsal and IV-V 9-11 anal rays, 30 to 32 scales in a longitudinal series, 15 to 20 gill-rakers on the lower part of the anterior arch, and 30 vertebræ (15+15 in two Athi specimens, 14+16 in one from Lake Naivasha). The outer teeth in the jaws are bicuspid in the young, but when a length of about 200 mm. (to base of caudal) is attained, most of them are simple and pointed. The largest specimens known measure about 300 mm. in length.

In the fossils, whenever the spinous part of the anal fin is complete (ten specimens), it consists of four spines; the soft rays, less easily counted, number 10 in two specimens, and probably 9 in one. The spinous part of the dorsal is complete in only one specimen, which has seventeen spines; in a second specimen 9 or 10 soft rays may be counted. A total of 30 vertebræ is obtained from one specimen; there are 15 caudal vertebræ in two, and perhaps a third, and 16 can be counted in one and, doubtfully, in a second. The teeth compare well with those of *T. nigra* (fig. 1). Gill-rakers are not preserved. The remains include those of fishes about 200 mm. in length to base of caudal.

Before making this identification and diagnosis it was necessary to define the limits of *T. nigra*, to disentangle

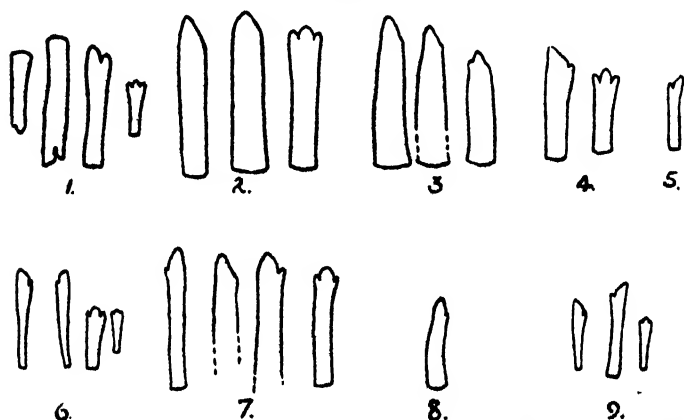
* *Oreochromis niger* Günther, Proc. Zool. Soc. 1894, p. 89, pl. ix.

† No Cichlids are recorded from the Tana basin.

it from *T. nilotica* (Linné), and to determine its relationship to *T. mossambica* Peters. This led to a revision of the genus *Tilapia*, some of the conclusions from which must be given here, together with other observations on the Cichlidae of East Africa.

(i.) *Tilapia nilotica* (Linné) is known from Palestine, the Nile, Lake Chad basin, Niger River, the Rift Valley lakes southward to Kivu and Tanganyika, from the Hawash River and the Abyssinian lakes, from Lakes Rudolf and Baringo, and from the Pangani River alone of the eastward-flowing rivers. In some of these localities subspecific

Fig. 1.



Teeth of *Tilapia nigra*, $\times 9$. 1-5, spirit-specimens; 6-9, fossils. Length of fish to base of caudal: 1, 162 mm. (Athi System); 2, 210 mm. (type, Athi); 3, 205 mm. (Naivasha); 4, 170 mm. (type, Athi); 5, 127 mm. (Naivasha); 6, 140 mm. (P. 20175); 7, ca. 200 mm. (P. 20174); 8, >160 mm. (P. 20190); 9, ca. 125 mm. (P. 20180). The tricuspid teeth are from inner series.

characters may be recognized, but the whole species is characterized by possessing 30 to 33 (very rarely 29) scales in a longitudinal series, 19 to 28 gill-rakers on the lower part of the anterior arch, outer teeth which remain bicuspid, or may even become tricuspid in full-sized specimens, and by the constant presence of only three anal spines. The vertebrae, counted in five specimens, number 31 or 32, of which 16 or 17 are precaudal.

Boulenger ('Catalogue of African Fresh-water Fishes,' iii. p. 162, 1915) included in *T. nilotica* a number of

specimens from East African rivers—Eusso Nyiro, Mwangaden River (south of the Athi System), Simba River (Athi System)—as well as the authentic Pangani specimen. Those from the Eusso Nyiro and Mwangaden River (including the types of *T. nyirica* Lönnberg and of *Chromis spilurus* Günther) are now seen to belong to *T. mossambica* Peters. Those from the Athi System are *T. nigra*.

(ii.) Later (Proc. Zool. Soc. 1916, pp. 345–347) Boulenger gave the name *Tilapia nilotica* var. *athiensis* to a collection of thirty-two fishes from the Athi System, all of which had four or five anal spines. These are also *T. nigra*, which is the only species of *Tilapia* known from the Athi System. Hubbs (Field Mus. Nat. Hist. Zool. xii. no. 2, 1918, p. 16) raised *T. nilotica* var. *athiensis* to specific rank as *T. athiensis*, and Pellegrin (Bull. Soc. Zool. France, li. 1926, p. 388) placed it in Günther's genus *Oreochromis*, thus tacitly affirming its relationship to *T. nigra*, but accepting Boulenger's pronouncement that they were distinct.

(iii.) *Tilapia mossambica* Peters, of which *Chromis natalensis* Weber, *C. vorax* Pfeffer, *C. spilurus* Günther, and *Tilapia nyirica* Lönnberg are synonyms, inhabits the eastward-flowing rivers from East London in the south to Webi Shebeli in Abyssinia. From the material available it appears that the area of distribution of *T. nilotica* is divided from that of *T. mossambica* by the watershed (Obora Mts., etc.) which divides the Hawash basin from the Shebeli, and by the Aberdare Mountains of Kenya. Further south the distribution of *T. nilotica* encroaches on the *T. mossambica* area in the Pangani River.

T. mossambica is characterized by the possession of 29 to 32 (rarely 33) scales in longitudinal series, 14 to 19 (rarely 20) gill-rakers on the lower part of the anterior arch, and by the strengthening and lengthening of the jaws and simplification of the teeth in mature males. The vertebræ number 29 or 30 (of which 14 or 15 are præcaudal, 15 or 14 caudal) in six specimens from Kenya, Lower Zambezi, and Natal, 31 (16+15) in three, and 30 (16+14) in one, from the Luangwa River, a tributary of the Zambezi. The anal spines number three, but four are found as an individual variation in one of a sample of 10 from Eusso Nyiro (see also footnote, p. 384).

Tilapia browni Nichols, 1923, founded on a single young fish from an upper tributary of the Webi Shebeli, has four anal spines, and is probably a variant of *T. mossambica*. "*T. browni* Nichols" of Fowler (Proc. Ac. Nat. Sci. Philad. lxxxviii. 1936, p. 324, figs. 141-146), from the Athi System, is identical with *T. nigra*.

(iv.) *Tilapia nigra* agrees better with *T. mossambica* than with *T. nilotica* in numbers of scales, vertebræ, and gill-rakers. It differs from *T. mossambica* mainly in having four or five anal spines, and in that the enlargement of the jaws is much less extreme and is not a sexual character. It may be considered to represent *T. mossambica* in the Athi System.

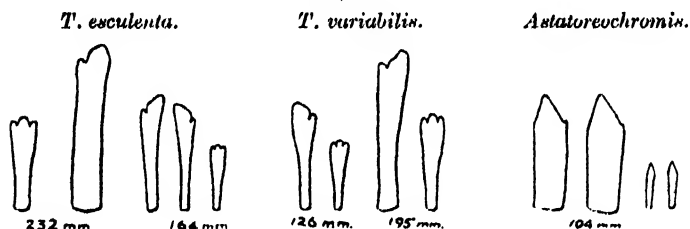
(v.) In addition to *T. nigra*, only two species of *Tilapia* are characterized by four anal spines. Of these, *T. shirana* Boulenger, of Lake Nyasa, retains bicuspid outer teeth to its full size, and *T. hunteri* (Günther), of Kilimanjaro, is more elongate than *T. nigra*, possesses 36 scales in a longitudinal series, and hence, probably, has at least 33 vertebræ. These are sufficient reasons for not identifying the fossils with either of these species.

(vi.) The fossil beds are in the Lake Victoria basin, but none of the species of *Tilapia* now found in Lake Victoria has more than three spines in the anal fin. The Victoria species are three, *T. variabilis* Boulenger *, *T. esculenta* Graham, and *T. zillii* (Gervais). As well as having fewer anal spines, *T. variabilis* and *T. esculenta* differ from *T. nigra* and the fossils in having more numerous teeth, with slender shafts, and crowns which remain bi- or tri-cusped throughout life (fig. 2); *T. zillii* never has as many as seventeen dorsal spines, and is sharply separated from *T. nigra* by the number of gill-rakers and by the pharyngeal dentition, characters which do not appear in the fossils; its vertebræ, counted in one specimen, number 29 (15+14).

* Boulenger (Cat. Afr. Fresh-water Fishes, iii. 1915, p. 168) gives the anal spines of *T. variabilis* as three (rarely four). I have examined his material, and it contains no specimen with four spines. His statement was probably based on his placing *T. galilæa* (non Artedi) Pellegrin (Mém. Soc. Zool. Fr. xviii. 1905, p. 183) in the synonymy of *T. variabilis*. Pellegrin finds among a score of specimens, either from Lake Victoria or from the Maji-Chumvi River, a single individual with four spines. His Lake Victoria specimens were possibly *T. variabilis*, but those from the Maji-Chumvi, a river in the extreme S.E. district of Kenya, are probably *T. mossambica*, and may well have included a fish with four anal spines.

(vii.) There is in Lake Victoria one Cichlid with four to six anal spines, namely, *Astatoreochromis alluandi* Pellegrin. This is not related to *Tilapia nigra*, nor to the genus *Tilapia*, but differs generically from *Haplochromis* only in the increased number of anal spines, resembling it and differing from *Tilapia* in the structure of the apophysis on the skull for the upper pharyngeals, and in possessing denticulate, not cycloid scales. These characters cannot be checked in the fossils, but *A. alluandi* is further distinguished from *T. nigra* and from the fossils in that it is not known to exceed a length of 140 mm. to base of caudal, and is more elongate in form (depth contained at least $2\frac{3}{4}$ times in the length); also there are not more than 9 soft rays in the dorsal or anal fin, the cleft of the mouth is longer and less broad, and the

Fig. 2.



Outer and inner teeth of some living Cichlids from Lake Victoria, with the length (to base of caudal) of each specimen. $\times 9$.

inner teeth, instead of retaining three almost equal cusps, have the middle cusp always longer than the lateral, which disappear in older fishes (fig. 2). The distribution of the vertebræ is also different; these number 13+17 in one specimen, 13+16 in another of *A. alluandi*. Further, in the shape of the opercular bones and in the width of the interorbital region the fossils agree with *Tilapia*, and differ from *A. alluandi*.

In conclusion, these fossils demonstrate the interesting fact that a species at present confined to the eastward-flowing Athi, and having closer relationship to the other East African species of its genus than to any now living in the Nile System or Lake Victoria, extended in Lower Pleistocene times into an area now included in the Lake Victoria basin.

*Notes on the Fossils registered in the British Museum
of Natural History.*

P. 20173. Nearly complete specimen, 154 mm. in length to base of caudal. Vertebrae 15+15 or 14+16; one of the caudal centra with two neural and two haemal arches. Seven or eight dorsal and four anal spines. 16 principal caudal rays.

P. 20174. Fish Cliff, Bed 5. Head and trunk of a fish of about 200 mm. Precaudal vertebrae 14. Four anal spines. Outer teeth with major cusp well developed and minor very small or absent (fig. 1 (7)).

P. 20175. Length 140 mm. to base of caudal. Four anal spines. Outer teeth with rather slender shafts and unequally bicuspid crowns (fig. 1 (8)).

P. 20176. Parts of five fishes, 100 to 150 mm. in length to base of caudal. In one, precaudal vertebrae 12+?, caudal 16. In another, anal with IV 10 rays.

P. 20177. Caudal region of small specimen. Impressions of about 16 vertebrae, perhaps all caudal. Anal with four spines and probably 9 soft rays. Dorsal incomplete.

P. 20178. Vertebrae and fins of a fish of about 180 mm. (excluding caudal). Vertebral column incomplete anteriorly. Precaudal vertebrae?, caudal 16. Dorsal?+XIV 9 or 10. Anal with four spines.

P. 20179. Fairly complete fish. Precaudal vertebrae?+12, caudal 15. Dorsal with 11 soft rays. Anal IV 10. 16 principal caudal rays.

P. 20180. Fish Cliff, Bed 7. Head and a few anterior ribs and dorsal fin-spines of a fish of about 125 mm. to base of caudal. Interorbital width as in a spirit-specimen of *T. nigra* of the same length. Outer teeth bicuspid, inner tricuspid (fig. 1 (9)).

P. 20181. Kanam West. Very imperfect fish. Four anal spines and base of a fifth ray which may have been spinous or flexible.

P. 20184. Incomplete fish. Four anal spines.

P. 20190. Imperfect head, with part of dorsal fin. Some teeth (fig. 1 (8)).

All the specimens came apparently from the same locality, but only a few are labelled "Fish Cliff, Bed 5," etc.

XXXVII.—Two new African Species of *Telenomus* (Hym., *Proctotrupoidea*). By G. E. J. NIXON, B.A., Department of Entomology, British Museum (Natural History).

THE two species which I am describing as new were received from Dr. Ch. Ferrière, of the Imperial Institute of Entomology, for identification. Both belong to the section of *Telenomus* in which the females have only ten segments in the antennæ. The number of African species now falling within this section is five; all of them are very distinct on account of the male genitalia alone, and, indeed, in one of the species which I am now bringing forward, this structure surpasses, in its exaggerated form, any male copulatory apparatus that I have so far examined in *Telenomus* in its widest sense.

The females, as usual, are much less easy to separate, but I give below a short key to include those of all five species.

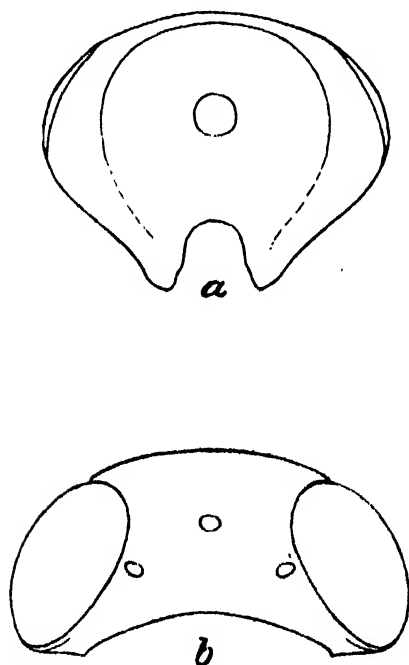
Telenomus (♀♀ with 10-segmented antennæ).

1. Segment 4 of the funicle more or less equal in size and width to 5, so that the club is sharply 5-segmented 2.
 Segment 4 of the funicle clearly smaller and narrower than 5, so that the club is not at all sharply 5-segmented. (Spp. with the hind wing very narrow, its fringe at widest part of wing being distinctly greater than half the width of the wing there.) 3.
2. Large sp., 1.5 mm.; legs markedly yellowish; stigmalis markedly long, sharply defined throughout, but pale yellowish. (Sp. with the hind wing broad, its fringe at widest part of wing very distinctly less than half the width of the wing there.) *cybele* Nixon.
 Smaller sp., 1 mm.; legs predominately brownish; stigmalis only rather long, more or less pale brownish *thoas* Nixon.
3. Segment 2 of the funicle markedly elongate, about $1\frac{1}{2}$ times as long as wide. (Sp. with the vertex falling away very sharply, more or less perpendicularly, to the occipital margin.) *narolus*, sp. n.
 Segment 2 of the funicle not at all, or hardly, longer than wide. (Small spp., at most .7 mm., with the stigmalis of normal length.) 4.
4. Occipital margin having a very wide circumference, so that the vertex behind the posterior ocelli has only a very short declivous surface *anates*, sp. n.
 Occipital margin having a much smaller circumference, so that the vertex has quite a long declivous surface (this is the usual condition in *Telenomus*), especially immediately behind each posterior ocellus *brimo* Nixon.

Telenomus anates, sp. n.

In my earlier key (Trans. R. Ent. Soc. Lond. 1935, p. 75) this species comes nearest to *brimo* Nixon, largely because of size and the short stigmal vein. Actually the two species have also the same type of antennæ, i. e., club more or less 4-segmented, though my key contradicts this, for, through error, I describe the antennæ

Fig. 1.

*a.* Head of *Telenomus anates*, sp. n. (from behind).*b.* Head of *Telenomus narolus*, sp. n. (from above).

of *brimo* as having a distinctly 5-segmented club. This applies, however, only to *cybele* Nixon and *thoas* Nixon. I give below a figure of the antenna of both sexes of *brimo* (fig. 2, *d*, *e*).

T. anates, sp. n., appears to differ from *brimo* only in a few details, but these are quite determinative.

♂♀. Antennæ blackish brown (slightly paler in the ♂, and with the scape yellowish). Legs with at least all

the femora predominantly brownish (sometimes paler in the ♂).

♀. *Head* almost exactly as wide as the thorax (measurement includes tegulæ) and, seen along a line perpendicular to a line between the posterior ocelli, almost exactly twice as wide as its greatest length. Head seen from behind different from *brimo* (see key and fig. 1, *a*). Shortest distance between the eyes fully $1\frac{1}{2}$ times as great as the width of an eye, as seen from above; the eyes are a little smaller than in *brimo* and the head is smaller in proportion to the size of the thorax. Antennæ (fig. 2, *a*).

Thorax less convex than in *brimo*, more shining, so as to be markedly shining, its sculpture very weak. Fore wings hyaline with a smoky-grey tinge; stigmalis a trifle shorter than in *brimo*.

Abdomen: tergite 2 entirely unsculptured except for a row of extremely short costæ at its extreme base; in *brimo* these costæ are slightly longer and medially tend to extend as feeble striations beyond the basal furrow.

♂. Antennæ not at all thickened towards the apex (fig. 2, *b*). Genitalia (fig. 2, *c*).

Length, ♂♀, .65 mm. approx.

Type in B.M.

TANGANYIKA TERR. (Moshi) (*A. H. Ritchie*): a large series, comprising both sexes, bred v. 1933 from eggs of a Geometrid moth on *Vangueria* sp.

Telenomus brimo Nixon.

1935. Trans. R. Ent. Soc. Lond. p. 78 (genitalia of ♂ and fore wing of ♀ figured).

See also fig. 2, *d* & *e*, ♂♀ antenna.

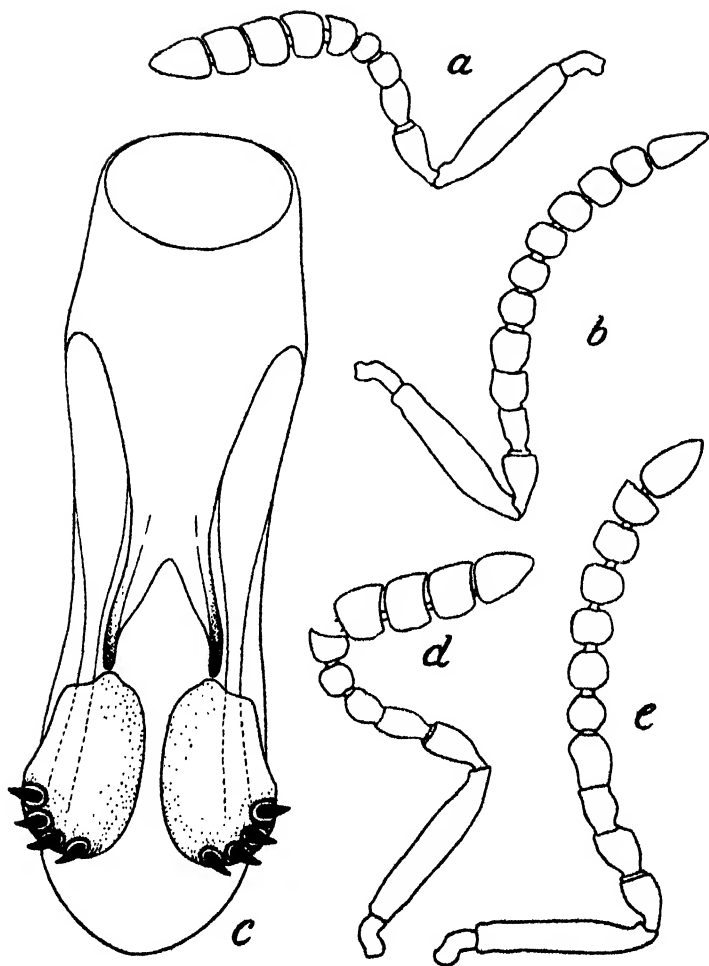
Telenomus cybele Nixon.

1935. Trans. R. Ent. Soc. Lond. p. 77 (genitalia of ♂, fore wing and antenna of ♀ figured).

Telenomus narolus, sp. n.

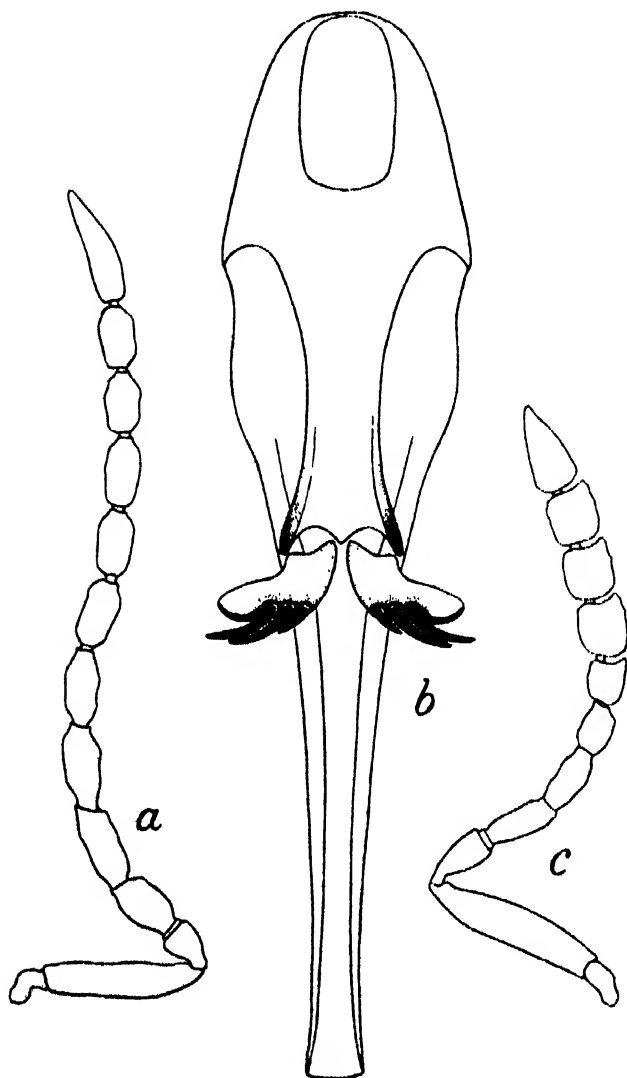
♂♀. Legs obscure honey-yellow, with the femora and tibiæ slightly darkened. Antennæ more or less dark brown with a faint yellowish tinge, the scape paler,

Fig. 2.



a, ♀ antenna ; *b*, ♂ antenna ; *c*, ♂ genitalia : all of *Telenomus anates*,
sp. n.
d, ♀ antenna ; *e*, ♂ antenna of *Telenomus brimo* Nixon.

Fig. 3.



Telenomus narolus, sp. n. : a, ♂ antenna ; b, ♂ genitalia ; c, ♀ antenna.

♀. *Head* not at all wider than the thorax (fig. 1, *b*). Frons entirely smooth except for an irregular row of sharply defined punctures along, and close to, the inner eye-margin. Vertex with scattered ill-defined punctures on a vaguely scaly-reticulate ground sculpture; further, the vertex is more prolonged *horizontally* backwards behind the posterior ocelli than usual, then falling away more or less perpendicularly to the occipital margin. Eyes large, the shortest distance between them, on the frons, not at all greater than the width of an eye, as seen from above; further, the eyes occupy virtually the whole lateral surface of the head, so that the surface between the posterior eye-margin and the occipital margin forms, when seen from above, more or less a straight edge almost at right angles to the long axis of the head. Antennæ (fig. 3 *e*): segment 2 of the funicle considerably longer than wide.

Thorax: mesonotum markedly flattened, shining and sharply but irregularly scaly-reticulate, the meshes of the reticulation larger and more oblong than in *cybele*, for example. Scutellum almost entirely smooth and shining. Fore wings with the venation almost colourless; stigma decidedly long.

Abdomen not much longer than wide, about 3:2; tergite 1 longitudinally costate almost to the apical margin; 2 not longer than its apical width, striate on about basal quarter.

♂. Antennæ (fig. 3, *a*). Genitalia very remarkable (fig. 3, *b*), quite unlike that of any other African *Telenomus* I have so far described.

Length, ♂♀, .9 mm. approx.

Type in B.M.

UGANDA (Kampala) (*C. C. Gourdey*): 17. x. 1915, series of 11 ♀♀, 9 ♂♂.

This species is largely characterized by the shape of the head, and further, in the female, by the slender funicle. The extraordinary genitalia of the male provide, until shown to be peculiar to a species-group, a certain clue to its identification.

Telenomus thoas Nixon.

1935. Trans. R. Ent. Soc. Lond. p. 78 (genitalia of ♂ and antenna of ♀ figured).

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 112. APRIL 1937.

XXXVIII.—*Records and Descriptions of North American Bees.* By CHARLES D. MICHENER, Pasadena, California.

(Concluded from p. 329.)

Halictoides eschscholtziæ, sp. n.

Male.—Length nearly 5 mm.

Head and thorax, including the propodeum, green; sculpture of head and thorax much as in *H. sandhouseæ*, but punctation somewhat finer and striæ of enclosure of propodeum finer; tegulæ and antennæ black, the underside of flagellum faintly dark brown; scape very broad, oval; flagellum crenulate, without long hairs, most of the segments about as long as broad; wings greyish, the wing-veins and stigma brown; legs much as in *H. sandhouseæ*, but femora and tibiæ not so strongly inflated, the hind tibiæ widest near the middle; hind tarsal joints 2 to 4 with short processes on one side; abdomen shining, sparsely punctate, the tergites with a strong greenish tinge, especially posteriorly, the posterior margins of the tergites hyaline; fourth (and to a slight extent third) sternite with inconspicuous subapical lateral tubercles; sixth sternite deeply concave medially, with a small triangular basal brown area, the apex somewhat brownish, produced apically into a rounded angle;

Ann. & Mag. N. Hist. Ser. 10. Vol. xix. 26

pubescence whitish, very long on lower edge of hind tibiae.

Female.—Length 5 mm.

Similar to male; flagellum black; pubescence dull pale ochraceous, with dark intermixed much as in *H. sandhouseæ*, but none on apex of abdomen; apex of abdomen with some reddish pubescence.

Holotype male, allotype female, and paratype: Altadena, California, on *Eschscholtzia californica*, April 18, 1935. Paratype male, same locality, May 18, 1935, on *Cryptanthus*: paratype female, Puddingstone Canyon, San Jose Hills, Los Angeles County, California, April 8, 1934, on *Eschscholtzia californica* (all Michener Coll.).

This is near *H. viridescens* Cwfd., but apart from the characters mentioned in the key below they differ by the character of the sternites of the male, Crawford's species having a pair of spicules on the fourth sternite and emarginations on the sides of the sixth.

Halictoides rhamni, sp. n.

Male.—Length $4\frac{1}{2}$ mm.

Inner orbits more strongly converging below than in *H. sandhouseæ* or *eschscholtziæ*; head and thorax blue-green, the head bluer; punctation much as in *H. eschscholtziæ*; enclosure of propodeum with finer, less conspicuous striae than in *eschscholtziæ*; tegulae and antennae black; scape oval; flagellum without long hairs, not so crenulate as in *eschscholtziæ*, the joints mostly a little longer than broad; femora and middle and hind tibiae somewhat enlarged, the hind tibiae widest beyond the middle; hind tarsi somewhat broadened, the joints 2 and 3 with short inconspicuous processes; wings greyish, the veins and stigma black; abdomen black, the posterior margins of the segments hyaline; sternites 3 and 4 each with a pair of subapical lateral tubercles; posterior margin of fifth sternite broadly emarginate; pubescence dull white, a little fuscous intermixed on front, vertex, scutum, and abdomen; scape, sides of face, supraclypeal area, and upper margin of clypeus with much black hair; hair of lower part of clypeus pure white.

Female.—As in *H. eschscholtziæ*, but abdomen without any greenish tinge.

Holotype male, allotype female, and female paratypes : Eagle Rock Hills, Los Angeles County, California, April 14, 1933, on *Rhamnus crocea* (Michener Coll.).

There is a compact group of Californian *Halictoides* known by the metallic coloration, small size, rather robust form, short antennæ in the males, and very broad scape in the males. I give a key to the species of this group.

Males.

- | | |
|---|----------------------------|
| 1. Flagellum with numerous rather long, slightly hooked, or curled hairs | <i>sandhouseæ</i> Mich. |
| Flagellum without long hairs | 2. |
| 2. Face below antennæ with abundant black hairs, although the clypeus, except its upper margin, is white-haired | <i>rhamni</i> Mich. |
| Face below antennæ with only white hairs. | 3. |
| 3. Propodeum black; abdomen not metallic. | <i>viridescens</i> Cwfd. |
| Propodeum green; abdomen greenish, especially posteriorly | <i>eschscholtziæ</i> Mich. |

Females.

- | | |
|---|---------------------------------------|
| 1. Flagellum brown beneath except at base .. | 2. [<i>escholtziæ</i> Mich. |
| Flagellum black | <i>rhamni</i> Mich. and <i>esch-</i> |
| 2. Tegulæ dark testaceous; short robust species | [(Ckll.). |
| Tegulæ black; a little more slender | (<i>Diandrena</i>) <i>scintilla</i> |
| | <i>sandhouseæ</i> Mich. |

Halictoides altadenæ, sp. n.

Female.—Length 4.5 to 5 mm.

Black, robust; face much broader than long; inner orbits parallel or very slightly diverging below; clypeus excessively short and broad, more than five times as wide as long; labial palpi short, joints 2 and 3 subequal, together equal to the first; fourth joint a little longer than third; blade of maxilla about three times as long as broad, narrowly rounded at apex; flagellum brown beneath, sometimes inconspicuously so; tegulæ fuscous; posterior margins of tergites broadly hyaline; mandibles rufescent medially; bases and apices of the two posterior pairs of tibiæ and parts of hind metatarsi rufescent; venter of abdomen reddish; head and thorax shining, rather finely but not closely punctate, the vertex more coarsely punctate than scutum, the apical half of clypeus impunctate, the pleura with only very minute piliferous

punctures, the propodeum largely impunctate, the enclosure with fine, close (or sometimes well separated), longitudinal striæ which leave a smooth shining margin on the enclosure laterally; posterior face of propodeum with a distinct oval median pit; wings slightly dusky, the veins and stigma nearly black, the second submarginal cell conspicuously shorter than first; tergites, except for the depressed hyaline apical margins, finely but not closely punctate; pubescence dusky ochraceous with a little fuscous on vertex and scutellum, nowhere very abundant, and not forming abdominal bands.

Male.—Length 4.5 to nearly 5 mm.

Similar to female, but inner orbits slightly converging below; vertex not particularly more coarsely punctate than scutum; apical part of clypeus not impunctate; testaceous margins of tergites less conspicuous; sternites less reddish; legs blacker, not modified; antennæ black, very short, hardly able to reach the tegulæ, most of the joints of flagellum wider than long, the flagellum not crenulate, and without hooked hairs; scape not enlarged as in the species of the preceding group; pubescence less abundant than in the female, not forming a dense beard on the clypeus as in many species; pubescence of dorsum of abdomen, especially apically, fuscous or blackish.

Holotype female, allotype male, and paratypes: Altadena, California, June 1, 1935, on *Eriophyllum confertiflorum* (Michener Coll.). Since writing the above numerous additional specimens have been collected on the same flower at Eagle Rock, California, May 9, 1936. Some males have the tarsi partly testaceous. A single male from Aliso Canyon, Los Angeles County, California, May 3, 1934 (*Michener*) has unusually pale tarsi and testaceous tegulæ. Further collecting may show this to be a distinct form, developed in response to the arid conditions of the north or desert side of the San Gabriel Mountains.

This species has the general appearance of *Amblyapis ilicifoliæ* Ckll., but in that species the enclosure of the propodeum is smooth and the blade of the maxilla is short and rounded. *H. boregoensis* Mich. has modified hind tarsi. *H. harveyi* Ckll. is larger, with longer antennæ in the male.

Halictoides harveyi sierræ, subsp. n.

Female.—Length a little over 5 mm.

Similar to typical *H. harveyi* Ckll., but smaller, the flagellum and tegulæ black.

Holotype female: Florence Lake, Sierra Nevada Mountains, California, July 1930 (*Michener*). This locality is at an altitude of 7300 feet in Fresno County.

I have compared this with the type of *H. harveyi*, and can see no other differences.

Halictoides ruficaudus, sp. n.

Female.—Length 4 mm.

Short, robust species; black, the apices of mandibles rufescent, the tegulæ piceous; first tergite red, the base black; second tergite red with a black spot on each side; third red, with a very small black spot on each side; fourth tergite red basally, suffused with black laterally and apically; fifth tergite black; sixth suffused with red basally; posterior margins of tergites hyaline; sternites black, the basal ones suffused with red; wings dusky brownish, the veins and stigma blackish; transfacial line considerably longer than facial; clypeus very short and broad, though not excessively so as in *H. altadena*; inner orbits very nearly parallel, perhaps slightly diverging below; head and thorax shining, distinctly punctate, the scutum a little more finely punctate than vertex; pleura more finely and closely punctate than scutum, with a distinct median depression; enclosure of propodeum rather dull, with fine, rather weak, longitudinal striæ; posterior face of propodeum shining, with very fine, sparse punctures, and a longitudinal median pit about twice as long as broad; tergites with distinct, not very fine, rather sparse punctures; basal parts of sternites impunctate, but apical parts with punctures similar to those of tergites; pubescence dull ochraceous, not abundant, not forming abdominal bands, some of the pubescence near apex of abdomen appearing pale fuscous in some lights.

Holotype and paratypes: Altadena, California, April 18 and 19, 1935, on *Eschscholtzia californica* (*Michener* Coll.).

This is an entirely isolated form, the only other species with reddish abdomen being the much larger, partly metallic *H. spilurus* Ckll.

Halictoides boregoensis, sp. n.

Male.—Length 5 mm.

Black, rather slender; head wider than long; eyes converging below; antennæ fairly long, the basal joints of flagellum longer than wide, the flagellum crenulate, brown beneath, without long hairs; wings clear, the veins and stigma brown, the latter quite pale; second abscissa of cubital vein a little shorter than fourth; legs normal except that the hind tarsi are slightly flattened, joints 2 to 4 slightly produced on one side; posterior margins of tergites broadly hyaline testaceous; last tergite pale ferruginous; tegulæ black, with a faint brownish tinge posteriorly; enclosure of propodeum striate; entire body shiny, the abdomen polished with few sparse punctures, the head and thorax with the punctures somewhat closer; pubescence white, very dense and long on the clypeus, dense but not so outstanding on most of the rest of face, copious on scutum, scutellum, pleura, legs, and somewhat less so on abdomen, where it forms very indistinct abdominal bands. (The abdomen is rather distinctly banded, but this is due mostly to the pale margins of the tergites.)

Holotype: Borego, California, March 1935 (*T. D. A.* and *W. P. Cockerell*), in Cockerell Collection.

The modification of the legs closely resembles that of *H. viridescens* Cwfd. and its relatives, but all of them are green species.

Halictoides australis, sp. n.

Male.—Length nearly 7 mm.

Black, rather slender; apices of mandibles reddish; posterior margins of tergites translucent; outer margins of tegulæ faintly translucent; wings dusky brown, the veins and stigma black; transfacial line longer than facial; inner orbits converging below; antennæ robust, strongly crenulate, very long (reaching propodeum); most of the segments of flagellum about twice as long as broad, but the first only about as long as broad; segments 3 to 10 of flagellum with a row of short hooked

hairs, about four or five per segment; legs simple; sixth sternite with a faint longitudinal median carina, and an apical process on which this carina is raised into a high keel; head and thorax rather distinctly and finely punctured, the scutum rather shiny, the punctures being sparser than on vertex and front; front duller than surrounding areas; pleura shining, rather sparsely punctured; sides of propodeum rather finely, and in some places densely, punctured; enclosure of propodeum rather broad, with a slightly raised margin; enclosure coarsely and evenly granular or reticulate, not striate; dorsum of abdomen, except for the shining posterior margins of the tergites, rather dull, and finely, though not closely, punctate; pubescence of head, thorax, and legs ochraceous, rather long, obscuring surface on clypeus; pubescence of abdomen pale ochraceous and rather short anteriorly, black on segments 4 to 6 except for narrow bands of pale on posterior margins of 5 and 6; no conspicuous abdominal hair-bands.

Holotype: San Diego, California (on the mesa northeast of town), April 1, 1934, on a yellow Composite (*Michener*).

This species differs from *H. harveyi* Ckll. and *H. boregoensis* Mich. by the presence of a row of hooked hairs on the flagellum, etc. The absence of striæ on the enclosure of propodeum is quite distinctive.

Halictoides davidsoni Cockerell.

California: Florence Lake, Sierra Nevada Mountains (Fresno County), July 1931; Tokopah Valley, Sequoia National Park, August 27, 1933, on *Gayophytum diffusum*; Big Bear Lake, San Bernardino Mountains, August 17, 19, and 27, 1933, and July 16, 1934; Bluff Lake, San Bernardino Mountains, July 15, 1934, on *Gayophytum ramosissimum* (all Michener Coll.).

Halictoides virgatus Cockerell.

California: Weldon Canyon, Los Angeles County, April 5, 1931; Aliso Canyon, Los Angeles County, May 3, 1931; Eagle Rock, April 17, 1935, on *Gilia multicaulis* (all Michener Coll.).

Segments 1 to 6 of the male flagellum each have a single hooked hair, or the first segment has two.

Halictoides mulleri Cockerell.

California : Altadena, on *Phacelia tanacetifolia*, April 8, 1936 (*Michener*).

The females have a few blackish hairs on the scutum not mentioned by Cockerell. The following are some characteristics of the male not recorded by Cockerell in his description (*Ann. & Mag. Nat. Hist.* ser. 8, vol. v., Jan. 1910, p. 24) :—Segments 1 to 8 of the flagellum with a row of hooked hairs on one side, there being about five or six hairs per joint ; posterior margin of fifth sternite with a slender, median, testaceous process ; sixth sternite rather membranous basally, this brownish area extending posteriorly on the median line between a pair of longitudinal grooves to the posterior part of the tergite ; posterior margin of sixth tergite with a long narrow process, the apical part laterally compressed, the ventral side excavated, the excavation bounded by carinæ, one on each side, which form the lateral margin of the process ; hind trochanter with a large flattened process having a broadly rounded apex.

Halictoides nemophilæ, sp. n.

Male.—Length 5.5–6.5 mm.

Black, the vertex and front faintly bluish (somewhat variable in colour), the anterior part of scutum usually very faintly greenish, the tergites faintly bluish in one specimen ; posterior margins of tergites translucent testaceous ; wings slightly dusky, the veins and stigma black ; transfacial line longer than facial ; eyes converging below ; labial palpi short, second joint about half as long as first, fourth joint equal to second, third shortest ; antennæ without hooked hairs ; joints of flagellum longer than broad, only slightly crenulate ; fore and middle legs normal, their femora distinctly more slender than in *H. mulleri* ; hind trochanter with a rather slender dull-pointed process ; hind femora and tibiæ greatly swollen ; hind basitarsus short and broad, truncate apically (not quite so broad as in *H. mulleri*) ; second joint of hind tarsus about as broad as long (broader than long in *H. mulleri*) ; abdominal structures similar to those described for *H. mulleri* in a preceding paragraph, but median process of fifth sternite a shorter broad lobe ;

sixth sternite entirely black, but structurally as in *H. mulleri* except for the apical process, which is narrower and more slender, more strongly compressed, and not excavated beneath; punctures of head and thorax rather fine. those of front and vertex very dense, those of thorax less dense, the scutum shiny; enclosure of propodeum with numerous fine longitudinal striæ; posterior face and sides of propodeum slightly roughened; tergites rather finely and sparsely punctate, the punctures of anterior tergites denser basally than apically; pubescence abundant, dull white or pale ochraceous, with some fuscous hairs intermixed on scape and vertex, and sometimes near upper edge of clypeus and on posterior tergites; pale hairs long on clypeus, obscuring its surface; abdomen without hair-bands; outer side of posterior tibiæ with a dense mass of white hairs on apical half.

Female.—Length 5–6.5 mm.

Similar to male, but metallic colour of head less strong, more greenish; tergites with a very faint greenish-blue tinge; eyes less strongly converging below than in the male; clypeus with large, not close, punctures; punctures of abdomen a little coarser than in the male; pubescence not obscuring surface of clypeus; apex of abdomen fulvous, with fuscous hairs basad to fulvous area; scopa with some fuscous hairs intermixed; apical abdominal hair-bands very inconspicuous; tergites 3 and 4 with basal white hair-bands, often obscured by posterior margins of preceding tergites.

Holotype male, allotype female, and paratypes: Tetleys Mountain Camp, San Bernardino Mountains, California, May 16, 1936, on *Nemophila*.

Related to *H. mulleri*, but smaller, male antennæ less crenulate, without hooked hairs; legs and abdominal structures slightly different; green colour more widely distributed, etc.

Halictoides bernardinus, sp. n.

Male.—Length about 6.7 mm.

Black slender species; wings dusky, the veins and stigma black; posterior margins of tergites translucent; facial line about as long as transfacial, the clypeus produced; inner orbits converging below; flagellum not

crenulate, without hooked hairs, the joints mostly longer than broad; legs rather slender, simple; sixth sternite with a median, discal, longitudinal ridge, and (apparently) an apical process, from both of which spring numerous long hairs; on each side of the ridge is a shining depression; punctures of head and thorax ~~fine~~, finer and closer on the scutum, which is rather dull, than on the top of head; punctures of clypeus very dense; pleura and sides of propodeum shining, slightly roughened, not distinctly punctured; enclosure of propodeum with a slightly raised posterior margin, and numerous fine longitudinal striae; posterior face of propodeum with some large punctures and a shallow median pit; tergites shining, with distinct rather sparse punctures except on the translucent posterior margins; pubescence dull white, not obscuring surface of clypeus, not forming abdominal bands; a few pale fuscous hairs on vertex and sides of sixth tergite; hind legs with some long hair.

Female.—Length nearly 6.5 mm.

Similar to male; inner orbits almost parallel; facial line very slightly shorter than transfacial; labial palpi long, the second joint about two-thirds as long as first, the third a little shorter than second, the fourth a little shorter than third, about half as long as first; clypeus with coarse, not close, punctures, and not produced; sides of face more coarsely punctate than vertex; scutum dull, with fine close punctures; vertex and scutellum more shiny; enclosure of propodeum with even finer striae than in male; sculpture otherwise much as in male; pubescence not abundant, dull white except for a few fuscous hairs basad to the bright fulvous apex of abdomen, and a very few fuscous hairs on base of clypeus.

Holotype male and allotype female: Tetleys Mountain Camp, San Bernardino Mountains, California, May 16, 1936 (*Michener*).

This species differs from *H. tinsleyi* Ckll. by the long tongue etc., and from *H. saundersi* Ckll. by the rather dull scutum.

Halictoides spiniferus (Viereck).

California: Florence Lake, Sierra Nevada Mountains, Fresno County, elevation 7300 feet, July 1931 (*Michener*); Crabtree Meadow, Tulare County, July 20, 1935 (*W. Evans*);

Bluff Lake, San Bernardino Mountains, August 23, 1933 (Michener).

Female.—Length 9–10 mm.

Facial line longer than transfacial; supraclypeal area with a strong, shiny, median, longitudinal carina; clypeus minutely roughened between very large punctures; rest of head much more finely punctate, but lower sides of face more coarsely and sparsely punctate and more shiny than vertex and front; pubescence of head all black, except for some fuscous hairs on cheeks and some pale hairs on occiput; antennæ short, the flagellum dusky brown beneath medially; scutum more finely punctate than in the male; pleura largely with black hair; scutum and anterior part of scutellum with numerous black hairs among the pale; pubescence of abdomen black except for a little reddish fuscous at apex of abdomen and basal white bands on tergites 2 to 5, that on 5 being narrow; pubescence of legs black, intermixed with a little pale on tarsi.

Diadasia sphæralcearum Cockerell.

Female.—Length 7 mm.

Similar to *D. diminuta* (Cress.), but smaller; pubescence somewhat more yellowish; tegulæ hyaline; wings more yellowish, the veins and stigma paler. (The latter character also holds in the males.) The underside of flagellum in both sexes may be brownish.

Mesilla, New Mexico, May 4, on *Rosa* (Cockerell). A label says that the eyes were sage-green in life. *D. diminuta* (Cress.) is also found at Mesilla.

Diadasia nitidifrons Cockerell.

Female.—Length about 9 mm.

Similar to male; abdomen with appressed pale ochraceous pubescence, forming bands the anterior margins of which are somewhat sinuate as in *D. rinconis* (Ckll.); pubescence of first tergite all pale, of second tergite pale with a few fuscous hairs basally, of third and fourth tergites black basally, the black of fourth often concealed beneath third; apex of abdomen with some dark brown hair; pygidial plate reddish basally; hair on inner side of hind basitarsi black; upper part of propodeum dull as in *D. laticauda* Ckll. (shiny in *D. diminuta*

and *D. sphæralcearum*); punctures of scutum much finer than in *laticauda*, decidedly coarser than in *diminuta*; hind tibial spurs not hooked as in *rinconis*.

Altadena, California, May 16, June 1 and 24, 1935, on *Sphæralcea* (Michener).

Rather abundant, as was also *D. laticauda* Ckll. The black hair on the bases of the abdominal segments of the males is rather variable, sometimes being present as far back as the sixth tergite.

Diadasia rinconis (Cockerell).

Females: Arizona (*A. Koebele*); Pasadena, California, July 1932 (Michener).

The Arizona specimen has the legs and sternites dark red, but is evidently the same species.

In a recent paper on *Ceratina* (Am. Mus. Novit. no. 844, Apr. 1936, p. 11) I suggested that *C. strenua* F. Sm. and *C. metallica* H. S. Sm. might be the same species. This is not the case, as is shown by additional specimens of true *metallica*. The two forms may be distinguished thus:—

- | | |
|---|--------------------|
| Legs brown, the anterior tibiae of both sexes with a pale stripe, or that of female reduced to a spot at base;
apex of male abdomen rounded | <i>strenua</i> . |
| Legs black, the anterior tibiae of both sexes with a pale stripe, that of female usually short; apex of male abdomen with a median process, as figured by H. S. Smith | <i>metallica</i> . |

In my key to the males in the paper cited, *C. strenua* would best be separated at the beginning, on account of the rounded apex of the abdomen. *C. metallica* is properly placed. In the key to the females *metallica* H. S. Sm. [which I have from Greenfield, Indiana, June 29, 1935 (*H. P. Amick*)] should be changed to *strenua* F. Sm. True *metallica* runs to *dupla* Say and *calcarata* Rob., differing from both by the small size, pale line on fore tibiae, etc.

Ceratina strenua F. Smith.

The following notes will aid in the determination of the female, which has not been described:—

Female.—Length 5.5 mm.

Dull metallic green; clypeus with a rather large pale yellow mark, which is widest below; tubercles pale

yellowish ; mandibles and labrum very slightly reddish ; antennæ dark brown, the flagellum paler beneath ; tegulæ and legs brown, the fore tibiæ with a pale yellow stripe or with a spot at base ; hind tibiæ with a basal yellow dot ; first tergite and posterior margins of other tergites dark brown ; wings rather dark brown ; black of scutum not reaching to parapsidal lines ; punctation somewhat coarser than in *C. metallica*, the punctures of pleura quite close anteriorly ; tergites more shiny and sparsely punctate than in *metallica* ; profile of sixth tergite largely concave.

Ashmeadiella stevensi, sp. n.

Female.—Length 7 mm.

Black, including mandibles and antennæ ; claw-joints of tarsi rufescent ; tegulæ with a reddish spot ; eyes greenish ; wings nearly clear, the second abscissa of cubital vein not as long as usual in this genus ; facial line considerably longer than transfacial ; median ocellus slightly nearer posterior edge of vertex than bases of antennæ ; inner orbits very slightly divergent below ; anterior margin of clypeus truncate as usual in the genus ; upper two-thirds of clypeus very shiny, the punctures very sparse ; rest of head and thorax more closely punctate ; anterior part of clypeus dull and closely punctate ; cheeks distinctly more finely punctate than pleura ; supraclypeal area very closely punctate and rather dull ; front, vertex, scutum, and scutellum shiny, the punctures moderate-sized or rather small, not very close ; punctures of pleura very slightly smaller than those of scutum ; abdomen shiny, the punctures of tergites 4 to 6 as large as those of scutum and close together, especially on sixth tergite ; punctures of first three tergites finer than those of scutum, close laterally, sparse medially ; first joint of labial palpi distinctly longer than second ; pubescence white, forming distinct narrow abdominal bands, that of first tergite slightly widened laterally ; apical segment pruinose ; sides of face with conspicuous white pubescence ; anterior margin of scutum without a pair of hair-spots ; pubescence of mandibles and that under margin of clypeus golden ; scopa white.

Holotype : Bowman, North Dakota, June 3, 1918, on *Opuntia polyacantha* (O. A. Stevens Coll.).

The scopa contains many of the coarse pollen-grains of the *Opuntia*.

Distinguished from all other described species by the sparsely punctate shining upper part of the clypeus. In the dull supraclypeal area, contrasting with surrounding areas, this species resembles *A. floridana* (Rob.). The head is rather peculiar and elongate in shape, the cheeks rather broad. The type has been returned to Prof. Stevens, who writes that it will be placed in the United States National Museum.

Ashmeadiella altadenæ Michener.

I find that there is a second specimen with the same data as the holotype in the Timberlake collection at the Citrus Experiment Station at Riverside, California. The species was described as having four short lines of pubescence on the scutum. This was due to an artificial change in position of some of the hair of the holotype. In reality there is not even a pair of hair-spots at the anterior edge of the scutum.

Titusella clypeata Michener.

Two additional specimens are from Eagle Rock, California, May 9, 1936, one on *Eriophyllum confertiflorum*, the other on *Cryptanthus* (Michener). The one on *Eriophyllum* was collecting pollen.

Osmia (*Acanthosmioides*) *unca*, nom. nov.

Osmia (*A.*) *uncinata* Mich., Can. Ent., Feb. 1935, p. 39, not Gerstaecker, 1869.

Osmia (*Acanthosmioides*) *depressa*, sp. n.

Male.—Length nearly 9 mm.

Blue-green, the sides of face, scutellum, and the area around ocelli brassy, the anterior half of clypeus rose-colour; flagellum brown, dark above, paler beneath, and crenulate; legs black, the fore and hind femora green; tegulae black, green anteriorly; pubescence of head and thorax white, that on clypeus dense and erect; pubescence of legs white; pubescence of first two tergites nearly all white, but second with a few fuscous hairs, especially laterally; third to fifth tergites with rather

long erect black pubescence, and appressed white pubescence on posterior margins; sixth tergite with white pubescence, mixed with some black on basal half; pubescence of seventh tergite pale; pubescence of sternites pale, mixed with black at sides; wings quite clear; second abscissa of cubital vein a little longer than fourth; head and thorax densely and closely punctate; area of propodeum rather dull, the upper part roughened; scutellum with an impunctate streak; hind basitarsi broader apically than basally; posterior impunctate margins of tergites very broad; margin of sixth tergite entire; seventh tergite bidentate, the teeth broad and blunt; process of second sternite appressed to third sternite, pointed at apex and broad at base when viewed from beneath.

Holotype: Colorado Springs, Colorado, May 25, 1934 (*M. & H. James*), in the collection of the Colorado State College at Fort Collins.

Process of second sternite much as in *O. crenulaticornis* Mich., but larger and more conspicuous. In *O. physarizæ* Ckll. and *O. erecta* Mich. the process of the second sternite is larger and stands out away from the third sternite.

Osmia dakotensis, sp. n.

Female.—Length 9–10 mm.

Very closely related to *O. melanotricha* Lovell & Ckll. The two species may be distinguished thus:—

<i>O. melanotricha</i> .	<i>O. dakotensis</i> .
Hair of clypeus dark fuscous, with a little pale intermixed.	Hair of clypeus all black.
Hair of cheeks white.	Hair of cheeks with black intermixed.
Hair of second tergite pale.	Hair of second tergite mixed with black or fuscous laterally.
Punctuation coarser, the punctures of anterior part of scutum the same size as those of front.	Punctuation finer, the punctures of anterior part of scutum finer than those of front.
Punctures of centre of scutum separated by shiny ground.	Punctures of centre of scutum less distinctly separated.
Enclosure of propodeum dull.	Lower part of enclosure of propodeum shiny.
Impunctate margins of tergites narrower.	Impunctate margins of tergites wider.
Second abscissa of cubital vein as long as first transverse cubital.	Second abscissa of cubital vein shorter.
Basal vein a little distad to transverse median.	Basal vein meeting, or slightly basad to, transverse median.

With all these differences the species are still very much alike. Perhaps *O. dakotensis* is best regarded as a subspecies of *O. melanotricha*. The latter species extends unaltered as far west as Minnesota.

Holotype and three paratypes: Bowman, North Dakota, June 23, 1918, on *Astragalus bisulcatus* and *Homalobus tenellus* (O. A. Stevens). There is another specimen from Dickinson, North Dakota, July 1, 1914, on *Astragalus nitidus*, and one from North-East Larimer County, Colorado, August 27, 1935, on *Astragalus* (Michener). The latter has the scutum and vertex blackish. It seems possible that Colorado records for *O. melanotricha* may have been based on this form of *O. dakotensis*. The holotype has been returned to Prof. Stevens, who states that it will be sent to the United States National Museum. The strigilis of *O. dakotensis* is similar to that of *O. subpurpurea jamesi*, except that the apical point is more robust and less sharply pointed.

Osmia pingreeana, sp. n.

Female.—Length 8.3–10 mm.

Rather elongate in form; blue-green, the posterior part of the abdomen often green, the clypeus and lower sides of face dark blue, or the clypeus sometimes blackish; scutum opaque blackish in most lights; legs black; tegulæ black, the anterior ends green; antennæ black, the underside of flagellum often reddish; pubescence of face black except for a small patch of whitish on each side of face at about the level of the bases of antennæ; anterior margin of clypeus with a pair of hair-tufts, dull orange or blackish, depending on the light in which they are viewed; pubescence of vertex black, some short pale hairs intermixed posteriorly; pubescence of cheeks nearly black, mixed with pale fuscous below; pubescence of thorax dull white, a few fuscous hairs intermixed on pleura, and a few longer black hairs intermixed on scutum and sometimes one or two on scutellum; pubescence of legs mostly black; scopa black; pubescence of first tergite whitish, of following tergites short and black; sixth tergite with some appressed white pubescence; second tergite sometimes with some pale hair on disk; wings rather dark brown; clypeus closely punctate, the anterior margin truncate and black; punctures of

scutum close, except on the central posterior part, where they are slightly separated; scutellum with an inconspicuous polished streak; area of propodeum slightly shiny below, dull and slightly roughened above; strigilis similar to that of *O. dakotensis*; tergites rather finely and sparsely punctured, the posterior impunctate margins rather broad.

Holotype: Pingree Park, Larimer County, Colorado, August 22, 1935 (*Michener*). Paratypes: same locality, August 19–22, 1935, and August 14–19, 1934 (*M. & H. James*). Most of the paratypes are in the collection of the Colorado State College.

Differs from *O. melanotricha* Lovell & Ckll. by the few black hairs of scutum, the small amount of white hair on sides of face, and the blackish and more closely punctate scutum; from *O. densa* Cress. by smaller size, presence of black hair on scutum, etc.; from *O. tokopahensis* Mich. by the presence of black hair on scutum, more finely punctate abdomen, etc.; from *O. subpurpurea* Ckll. and its subspecies *jamesi* Mich. by the absence of long curled hair on cheeks; from *O. mertensiae* Ckll. by the black hair on clypeus; from *O. subarctica* Ckll. and *O. pentstemonis* Ckll. by black legs; from *O. caulicola* Ckll. by larger size, more slender form, more finely punctate abdomen, and fewer black hairs on scutum; from *O. albolateralis* Ckll. by smaller size, small amount of white hair on sides of face, presence of black hair on scutum, and near absence of it on scutellum; from *O. phaceliæ* Ckll. by less pale hair on sides of face, less black on scutellum, apparently blacker tegulæ, black hind femora, and black hair of second tergite; from *O. olivacea* Ckll. by smaller size, less pale hair on head, etc.; from *O. clarescens* Ckll. by blackish scutum, more finely punctate abdomen, etc.; from *O. potentillæ* Mich. by much larger size; from *O. pseudamala* Ckll. by the fewer black hairs of scutum and scutellum, etc. The black hairs of the scutum are so few as to be inconspicuous. This species is perhaps closest to *O. phaceliæ* Ckll.

Osmia subpurpurea jamesi subsp. n.

Female.—Length 11–13 mm.

Similar to the Pacific Coast *O. subpurpurea* Ckll., but less black hair on lower part of cheeks, the long curled

hairs sometimes fuscous ; hair of scutellum entirely pale ; scutum with only a few black hairs among the pale ; pale bands on posterior margins of tergites absent.

Fig. 3.



Strigilis of *Osmia subpurpurea jamesi*, subsp. n. (♀).

Holotype : Pingree Park, Larimer County, Colorado, August 19-22, 1935 (*M. & H. James*), in the collection of the Colorado State College. Paratypes : same data ; also Boulder, Colorado, June 1929 (*Norma LeVeque*) ; Hubbard Ranch, Elbert, Colorado, on flowers of *Gilia*, June 9 (*Figgins*).

XXXIX.—*Entomological Expedition to Abyssinia, 1926-7 : Coleoptera, Carabidæ ; the Genera Bembidion and Tachys* *. By Dr. FRITZ NETOLITZKY, University of Czernowitz (Cernăuți), Rumania. Edited and with Introductory Note by HUGH SCOTT, Sc.D., Department of Entomology, British Museum (Natural History).

[NOTE.—Nine forms of *Bembidion* and sixteen of *Tachys* are enumerated. In the case of *Tachys* the sixteen include only thirteen species, three species being represented by two subspecies apiece. Three species of *Bembidion* new to science were discovered by the Expedition ; two of these were described by Dr. Netolitzky in 1931 in a paper cited below, but are figured here for the first time. In *Tachys* two new subspecies are described.

One of the species of *Bembidion* (*B. scotti*), discovered on Mt. Chillálo at an altitude of 10,000 feet, belongs to a group of species (comprising the subgenus *Omotaphus*)

* A general report on the Carabidæ by C. Alluaud has appeared in *Ann. & Mag. Nat. Hist.* (10) xix. p. 272 (1937), and an account of the Trechini by R. Jeannel, *Rev. française d'Ent.* ii. pp. 205-212 1936.

restricted to Africa, Madagascar, and St. Helena. The type-species of this subgenus occurs in Egypt as well as Abyssinia, and thus extends into the Palearctic, where, however, it is considered to be a foreign intruder*. The other *Bembidion* (*B. mus*), discovered in the same spot, is referred to a subgenus (*Hypsipezum*) including only one other species, which inhabits Mt. Kenya and the Aberdare Mts. at altitudes between 9000 and 10,000 feet; thus we have two species of this subgenus, very closely allied, both flightless, inhabiting mountain-massifs 600 miles or more apart†. The new species (*B. scottustulatum*) described below, discovered in Jem-Jem Forest at 8000 feet, is closely related to a Palearctic species. Five of the remaining species of this genus are referred to forms recorded only from Abyssinia—though two of these are regarded as geographical races of species occurring in the southern Palearctic—while the sixth is referred with some reservation to a South African species.

In *Bembidion*, therefore, an endemic element is represented, but there are some relationships with the fauna of East (and possibly South) Africa, and there is also a link with that of the Palearctic Region.

In many of the species of *Tachys* a large part, or the whole, of the specimens was found at medium altitudes, about 5000 to 7000 feet. Dr. Netolitzky remarks ("Schlussbemerkung," p. 421, below) on the close relationship between the Abyssinian and South African representatives of this genus. Three of the Abyssinian representatives are actually identical with South African forms, and the two new forms described are subspecies of South African species. When the *Tachys* of the intervening countries are better known, especially those of the higher eastern parts of the African Continent, it will probably be found that the range of many of the species occurring at medium altitudes extends from Abyssinia to South Africa, and that some of these wide-ranging species are represented by several geographical races. On the other hand, five of the forms (species or subspecies) of *Tachys* enumerated below are recorded only from Abyssinia, four are Mediterranean, and one

* Netolitzky, Wien. Ent. Zeit. xlvii. p. 170, 1931.

† Netolitzky, *op. cit.*, p. 180.

is referred, as a variety, to an Oriental species (*T. unistriatus*).

The locality-lists are compiled from my field-notes. The habitats in which the species were found are, on the whole, what might be expected. The two new species of *Bembidion* from Mt. Chillálo were found on the heath-land under burnt logs of the tree-heath (*Erica arborea*), but also in other situations; the other species of *Bembidion* mostly under stones in the beds or at the edges of mountain rivers and streams. Most of the species of *Tachys* were collected (several of them in large numbers) on the shores of lakes or the banks of water-holes and more sluggish rivers. The finding of several specimens (*Tachys hæmorrhoidalis* subsp. *abyssinicus*) in weed half a mile from the shore in Lake Zwai is noteworthy; and the occurrence of one example (*Tachys spurius*) in a decayed portion of a tree-Euphorbia adds another (though probably only a casual predator) to the list of species associated with these plants in Abyssinia.

The types of the new species and subspecies are in the British Museum.—H. S.]

Fig. 1.



Bembidion scotti Netolitzky.

BEMBIDION Latr.

Subgenus OMOTAPHUS Netolitzky, Ent. Blatt. x. p. 167, 1914 ;
id., Wien. Ent. Zeit. xlvii. p. 169, 1931.

Bembidion scotti Netolitzky, Wien. Ent. Zeit. xlvii.
p. 172, 1931.

Loc. Abyssinia: "Mt. Chillálo, moorland, ca. 10,000 feet, under burnt logs of giant heath (*Erica arborea*), and in forest, ca. 9000 feet, under stones near stream, xi ; 6 ex. (*Scott*)."

Bembidion mixtum Schaum, var. *tropicum* Chaud.

Loc. Abyssinia: "between Jem-Jem and Wouramboulchi, 8000–9000 feet, x ; Akaki ravine, 6500–7000 feet, x ; Kattere river, north-east of Lake Zwai, 6000 feet, xi ; Mt. Chillálo, 7000–8000 feet, 8. xi, and under stones near a stream in the forest, ca. 9000 feet, xi ; lakes of Addas, Hora Harsadi and Bishoftu, 7000 feet, 3–4. xii ; Mulu, above the Muger valley, from a mountain stream, 8000 feet, xii ; Douber river, between Debra Libanos and Addis Ababa, 8500 feet, i ; 21 ex. (*Scott, Omer-Cooper*)."

B. mixtum ist von Aegypten, die Varietät *tropicum* nur von Abyssinien bekannt.

Subgenus NOTAPHOMIMUS Netolitzky, Wien. Ent. Zeit.
xlvii. p. 175, 1931.

Bembidion diversum Pér. ?

Es ist nur ein Stück vorhanden: "west side of Lake Zwai, ca. 5500 feet, xi (*Omer-Cooper*). Die Punkte in den Streifen der Flügeldecken sind gröber als bei den Exemplaren von Rhodesia und Südafrika, doch gestattet das einzige Stück keine Mutmassungen über eine rassische Verschiedenheit.

Subgenus PERYPHUS Stephens.

Bembidion scottustulatum, sp. n.

Zwei Exemplare von Djem-Djem Forest gehören in den engen Verwandtschaftskreis des *B. ustulatum* L., kenntlich an der Gesamtform und Skulptur von Kopf, Halsschild und Hinterleib. Besonders wichtig ist für die Gruppe die Ausbildung der kurzen Falte in den Hinterwinkeln des Halsschildes, welche den borstentragenden Punkt nicht erreicht, also unvollständiger ist und dabei wie ein Beistrich etwas nach aussen gerichtet

ist. Bei dem sehr ähnlichen *B. africanum* Chaud. ist diese Falte lang, gerade und überall scharf markiert. Der Rand des Halsschildes ist bei *B. ustulatum* breiter (besonders gegen den Kopf zu) als bei *B. scottustulatum*; die Schultern des letzteren sind weniger abgeflacht und die Streifen der Flügeldecken reichen weiter nach hinten, als bei der Linne'schen Art. Alle sieben Streifen sind im vorderen Drittel grob punktiert, viel stärker, als bei dem Durchschnitt der Europäer und Asiaten. Von den vier Flecken sind nur ganz verwaschene Spuren zu erkennen, doch sind sie nicht ganz verschwunden. Sonst stimmt die Farbe der Fühler, Palpen und Beine mit *B. ustulatum* überein.

Länge: 4.5–5 mm.

Loc. Abyssinia: "Jem-Jem Forest, from river-bed, ca. 8000 feet, 2. x, 2 specimens (Scott)."

Bembidion africanum Chaudoir.

Loc. Abyssinia: "Jem-Jem Forest, from river-bed, ca. 8000 feet, 2. x, 5 ex. (Scott); Mt. Chillálo, ca. 9000 feet, under stones near a stream in the forest, 15. xi, 1 ex. (Scott)." Nur aus Abyssinien bekannt.

Bembidion atlanticum Woll., var. *adovanum* Chaud.; Csiki, Coleopt. Cat. (Junk), Carabidæ, Harpalinæ i. p. 85, 1928, und Harpalinæ viii, p. 1646, 1933.

Loc. Abyssinia: "Debra Libanos, ca. 8000 feet, 2. i, 4 ex. (Scott)."

B. atlanticum wurde von Madeira beschrieben. Einige Varietäten sind in Zentral- und Süd-Europa, im Mittelmeergebiet usw. verbreitet. Die Rasse *adovanum* ist nur von Abyssinien bekannt.

Bembidion melanocentrum Chaudoir.

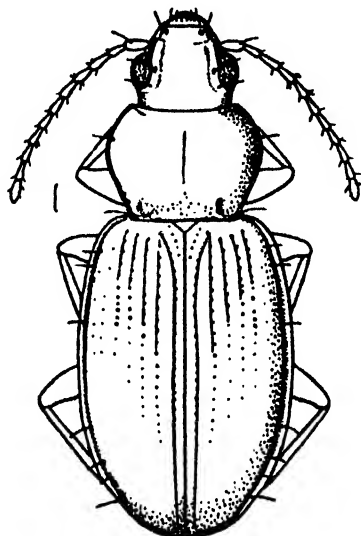
Loc. Abyssinia: "Entoto, ca. 9000 feet, 10. xi; cultivated country near Addis Alam, 8000 feet, 18. ix; Mt. Chillálo, ca. 9000 feet, under stones near a stream in the forest, 15. xi; Douber river, between Debra Libanos and Addis Ababa, ca. 8500 feet, 5. i; 31 ex. (Scott)." Die Art ist nur aus Abyssinien bekannt.

Subgenus *HYPSIPSEUM* Alluaud.

Bembidion mus Netolitzky, Wien. Ent. Zeit. xlvii. p. 178, 1931.

Loc. Abyssinia: "Mt. Chillálo, moorland, ca. 10,000 feet, under burnt logs of giant heath (*Erica arborea*), and above 12,000 feet, under stones or moss beneath alpine plants, 17-19. xi; 34 ex (*Scott*)."

Fig. 2.

*Bembidion mus* Netolitzky.

Subgenus SYNECHOSTICTUS Motsch.

Bembidion fontinale Raffray ?

Es ist ein Stück vorhanden ("Mt. Chillálo, ca. 9000 feet, under stones near a stream in the forest, 15. xi (*Scott*)"), das vorläufig als diese nur aus Abyssinien bekannte Art determiniert ist.

TACHYS Stephens *.

Tachys bistriatus Duftschm.

Loc. Abyssinia: "Jem-Jem Forest, ca. 8000 feet, ix, 38 ex. (*Omer-Cooper, Scott*)."
Europa, Mittelmeergebiet.

* [In this genus the species are arranged alphabetically, not under subgenera. But in certain cases Dr. Netolitzky has given notes on the subgenus to which the species is referred.—H. S.]

Tachys grandicollis Chaud., var. *pullus* Jacq. du Val.

Loc. Abyssinia : "shores of Hora Shala, ca. 5000 feet, 21. xi, 5 ex. (*Omer-Cooper*)."

T. pullus wurde von Algier beschrieben; die Art *grandicollis* ist vom Caucasus, von Kleinasien, Syrien usw. bekannt.

Tachys hæmorrhoidalis Ponza, subsp. *crassescens* Pér.

Loc. Abyssinia : "numerous specimens, found at various points between 5500 and 9000 feet; neighbourhood of Lake Zwai, marsh on west shore, 5500 feet, xi, and Kattere river, north-east of the lake, ca. 6000 feet, xi (a long series) (*Omer-Cooper*); water-hole north of Makki river, ca. 6000 feet, xi (*Omer-Cooper*); lakes of Addas, Hora Harsadi, Hora Bishoftu and Hora Keloli, 7000 feet, 1-4. xii, a long series (*Omer-Cooper*); Mt. Chillálo, 7000-8000 feet, from edges of mountain-streams, and one specimen from flood-rubbish in a stream at 9000 feet, xi (*Scott*); Boru stream, north of Mt. Chillálo, 7500 feet, xi, a series (*Scott*); 126 examples in all."

T. crassescens wurde von Natal beschrieben; die typische Form der Art *hæmorrhoidalis* ist von Mitteleuropa und vom Mittelmeergebiet bekannt.

Tachys hæmorrhoidalis Ponza, subsp. *abyssinicus* Chaud.

Loc. Abyssinia : "numerous specimens from points at altitudes between 5000 and 8500 feet; neighbourhood of Lake Zwai, marsh on west shore, 5500 feet, and Kattere river, ca. 6000 feet, xi (*Omer-Cooper*); shores of lakes Hora Abjata and Shala, 5000 feet, xi, many examples (*Omer-Cooper*); Lake Zwai, taken from weed half a mile from the shore, near the mouth of the Sucsuci river, 17. xi (*Omer-Cooper*); Mt. Chillálo, 7000-8000 feet, xi; lakes of Addas, Hora Bishoftu and Hora Keloli, 7000 feet, 2-4. xii (*Omer-Cooper*); Mulu, above the Muger valley, 8000 feet, from vegetation, etc., at sides of mountain streams, several examples, xii (*Scott*); Douber river, between Debra Libanos and Addis Ababa, 8500 feet, 5. i, 1 ex. (*Scott*); 86 specimens in all."

T. abyssinicus ist nur von Abyssinien bekannt.

Das Subgenus SPHÆROTACHYS wurde von J. Müller (Cat. Col. Ven. Giulia, p. 95, 1916; Col. Centralblatt, v.

p. 2, 1930) auf *T. hæmorrhoidalis* Ponza begründet. Im Katalog von Csiki sind als Subspecies hierhergezogen: *T. abyssinicus* Chaud., *curticollis* Sloane und *kanalensis* Perris. Nach Einsichtnahme in das Material des British Museum kann ich jetzt auch *T. crassescens* Pér. hierherstellen. Dieses Tier unterscheidet sich vom *T. abyssinicus*, von dem ich ein Originalstück vergleichen konnte, durch das Vorhandensein je einer ziemlich gut begrenzten hellen Makel vor der Spitze der Flügeldecken, während diese bei *abyssinicus* gleichmässig dunkel sind; bei *T. hæmorrhoidalis* typ. liegt vor der Spitze nur eine verwaschene rötliche Stelle.

Tachys imitans Péringuey, var.

Diese Art ist vom Cap und von Natal beschrieben und wird mit *T. apicalis* Boh. verglichen. Ein Stück von Abyssinien ("Muger valley, ca. 5500 feet, 28-29. xii, Scott") unterscheidet sich von den mir vorliegenden Exemplaren aus Uitenhage, Cape Colony nur durch weniger deutliche Fleckung auf den Flügeldecken. Es ist nicht ausgeschlossen, dass es sich um einen Uebergang zu den ganz dunklen, aber kleineren Stücken vom selben Fundorte handelt, die ich nach dem Finder benennen möchte:

Tachys imitans Pér., subsp. *scotti*, n.

Es sei bemerkt, dass sich diese *Subspecies* vom ähnlichen *T. majusculus* Chaud. dadurch unterscheidet, dass letzterer stärker gewölbt ist und deutlichere Punktierung in den beiden Streifen der Flügeldecken zeigt, wie mich ein Originalstück von Chaudoir gelehrt hat.

Bei allen Vertretern dieser Gruppe verläuft der abgekürzte Basalrand der Flügeldecken bogenförmig, ist also nicht scharf winkelig oder dachartig gestellt.

Loc. Abyssinia: "Muger valley, ca. 5500 feet, 28-29. xii, 3 ex. (Scott)."

Tachys iridipennis Chaudoir.

Loc. Abyssinia: "Debra Libanos, ca. 8000 feet, 2. i, 1 ex. (Scott)." Nur von Abyssinien bekannt.

Tachys lucasi Jacq. du Val.

Loc. Abyssinia: "Lake Zwai, Sucsuci, ca. 5500 feet, 12. xi, 1 ex. (Omer-Cooper)." Madeira, Mittelmeergebiet, Aegypten usw,

Tachys lucasi Jacq. du Val, subsp. *germanus* Chaudoir.

Tachys germanus Chaud., Csiki, Col. Cat. (Junk), Carabidae, Harpalinae, i. p. 181, 1928.

Loc. Abyssinia: "numerous specimens from the neighbourhood of Lake Zwai and the foot of Mt. Zukwala and Mt. Chillalo; river south-west of Mt. Zukwala, ca. 6000 feet, 31. x; plains north-west of Lake Zwai, 5500–6000 feet, 31. x–1. xi; Kattere river, north-east of the lake, ca. 6000 feet, 5–6. xi (many examples); water-hole north of Makki river, ca. 6000 feet, xi; 39 examples in all (*Omer-Cooper, Scott*)."

Durch Vergleich mit dem Typus von *germanus* determiniert. *T. germanus* ist nur von Abyssinien bekannt.

Tachys majusculus Chaudoir.

Loc. Abyssinia: "lakes of Addas, shores of Hora Harsadi, ca. 7000 feet, 3. xii, 1 ex. (*Omer-Cooper*); Muger valley, ca. 5500 feet, 28–29. xii, 6 ex. (*Scott*); Debra Libanos, ca. 8000 feet, 2. i, 4 ex. (*Scott*)."

Mit dem Typus verglichen. Die Art ist nur von Abyssinien bekannt.

Tachys optimus Péringuey, subsp. *abyssiniae*, n.

Loc. Abyssinia: "Kattere river, north-east of Lake Zwai, ca. 6000 feet, 5–6. xi, 25 ex. (*Omer-Cooper, Scott*); lakes of Addas, Hora Bishoftu, ca. 7000 feet, 2. xii, 1 ex. (*Omer-Cooper*)."

Die abyssinischen Exemplare unterscheiden sich von den untersuchten Stücken des *T. optimus* von Rhodesia dadurch, dass die Scheibe der Flügeldecken dunkler ist als die Schultern und Spitzen; dadurch entsteht eine Art von Vierfleckung, die allerdings ganz unbestimmt ist, aber doch gegenüber dem typischen *T. optimus* von Südafrika einigermassen auffällt.

Das Subgenus *TACHYLOPHA* wurde von Motschulsky (Etud. entom. xi. p. 27, 1862) auf *Tachys ovatus* Motsch. begründet (*albicornis* Schaum, *mirabilis* Bates, *mirandus* Dupuis). Charakteristisch ist die zahnartige Bildung des Randes der Flügeldecken an der Schultergegend, sowie die besondere Gestalt des Halsschildes. Dadurch

ist die Untergattung *TACHYLOPHA* eine hochspezialisierte Gruppe, deren Zentrum im Gebiete Ost- und Südafrikas liegt. Hierher gehört noch, nach dem Materiale des British Museum, "*T. servilis*" Pér. und *T. humeralis* Pér.

Tachys socius Schaum.

Tachys fumigatus Motsch., var. *socius* Schaum; Osiki, Coleopt. Cat. (Junk), Carabidæ, Harpalinæ i. p. 180, 1928.

Loc. Abyssinia: "Sucsuci river (between Lake Zwai and lake Hora Abjata), between 5500 and 6000 feet, 12. xi, 1 ex. (*Omer-Cooper*); Makki river, north-west of Lake Zwai, ca. 6000 feet, 6. xi, 1 ex. (*Scott*); water-hole north of Makki river, ca. 6000 feet, xi, 3 ex. (*Omer-Cooper*)."

Tachys socius ist von Aegypten und von dem Mittelmeergebiet bekannt; die Art *fumigatus* ist von Aegypten weit über die orientalische Region verbreitet.

Anmerkung. Bei der Gruppe des *T. fumigatus* Motsch. (*geminatus* Schaum, *socius* Schaum, *emarginatus* Nietn.) unterscheiden sich die Stirnfurchen dadurch, dass diese zwar ebenfalls zum Clypeus scharf konvergent verlaufen, aber nach dem Nacken zu sind sie etwas nach innen gebogen, sodass die Form einer Zange entsteht. Ich benenne die Untergattung: *TACHYPHORCEPS* Subg. nov.

Tachys spurius Péringuey.

Loc. Abyssinia: "numerous specimens, from places at altitudes ranging from 3000 to 12,000 feet, and from very varied habitats; Hawash railway halt, ca. 3000 feet, 2. ix, at light, 1 ex. (*Scott*); Jem-Jem Forest, from riverbed, ca. 8000 feet, 2. x, and from nearly 9000 feet (including one specimen from beneath bark of a decaying mimosa) (*Scott*, *Omer-Cooper*); from streams near the foot of Mt. Zukwala, ca. 6000 feet, x, xi (*Omer-Cooper*); Mt. Chillalo, from forest, ca. 9000 feet, by sifting humus and under bark, 12-13. xi, several specimens, also one from the highest moorland, ca. 12,000 feet, under stones beneath alpine plants, 18. xi (*Scott*); Lake Haramaiya, 6600 feet, from decaying parts of a tree-Euphorbia, 29. i, 1 ex. (*Scott*); 37 specimens in all."

Tachys spurius ist von Rhodesia (Salisbury) beschrieben. In meiner Sammlung befindet sich ein Stück: *Tachys joguna* Alluaud in litt., Afr. or. angl., Wa-Kikuyu,

Rivière Tchania, 1912, 1520 mètres (*Alluand et Jeannel*). Die Tiere von Abyssinien stimmen mit der Beschreibung überein, ebenso bei dem Vergleiche mit Exemplaren von Rhodesia aus der Sammlung des British Museum.

Tachys unistriatus Putzeys, var.

Loc. Abyssinia: "Jem-Jem Forest, ca. 8000 feet, ix, 41 ex. (*Omer-Cooper, Scott*); Kattere river, north-east of Lake Zwai, ca. 6000 feet, 6. xi, 1 ex. (*Scott*)."

Von Djem-Djem Forest liegen eine Reihe Exemplare vor, die sehr nahe mit *T. globulus* Dej. und *T. caraboides* Motsch. verwandt sind, am meisten aber mit *T. unistriatus* Putz., *T. bifoveatus* M'Leay und *T. haliploides* Bates (Subgenus ELAPHROPUS Motsch.). Ich wage keine Neubenennung des abyssinischen Tieres, da die ganze Gruppe einer eingehenden Kritik zu unterwerfen ist, zu der mir das Material fehlt. Beispielsweise sind Stücke des *T. debilis* Pér. von Rhodesia (British Museum) mit *T. unistriatus* Putz. aus Tenasserim (det. H. E. Andrewes) fast identisch; *T. humilis* Pér. von Natal und Rhodesia ist von *T. haliploides* kaum zu trennen; *T. fartus* Pér. hat sehr nahe Beziehungen zu *T. globulus* und *T. caraboides*.

Tachys vagans Péringuey.

Loc. Abyssinia: "river south-west of Mt. Zukwala, ca. 6000 feet, 31. x, 1 ex. (*Omer-Cooper*); Kattere river, north-east of Lake Zwai, ca. 6000 feet, 6. xi, 3 ex. (*Scott*)."

Tachys vagans Pér. ist von Natal beschrieben. Die Bestimmung der abyssinischen Tiere erfolgte nach der Originalbeschreibung und auf Grund eines Stückes von Péringuey aus Rhodesia (British Museum). Die Art ist ganz wenig grösser als der europäische *T. parvulus*, dem sie sehr gleicht, was die Form und Skulptur anbelangt, nur hat *T. vagans* auf jeder Flügeldecke vier charakteristische, nahezu unpunktete, Streifen.

Tachys variabilis Chaudoir.

Loc. "French Somaliland: Jibuti, 29-31. viii, 1 example, which flew to light at the Hôtel Continental (*Omer-Cooper*)."

Die Art ist von "Abyssinien," aus der Sammlung von Raffray, ohne genauere Angabe des Fundortes beschrieben.

SCHLUSSBEMERKUNG.

Ohne Kenntniss der von Péringuey aus Südafrika beschriebenen Tiere kann eine verlässliche Benennung der in Abyssinien und im Sudan vorkommenden Arten nicht erfolgen. Es sei daher noch auf einige Vergleiche hingewiesen, die mir das in so freundlicher Weise vom British Museum zum Studium beigestellte Material ermöglichte.

Tachys nigrolimbatus Pér. ist sehr nahe verwandt oder gleich dem *T. pullus* Duv. (*grandicollis* Chaud., var. *pullus* Duv.).

Tachys faustus Pér. von Natal kann ich von *T. germanus* Chaud. kaum trennen (vergl. auch *T. lucasi* Duv.).

Tachys vesus Pér. ist eine besondere Art im Subgenus TACHYTA.

Tachys fartus Pér. ist eingehend mit *T. caraboides* Motsch. (*globosus* Chaud.) zu vergleichen, ebenso *T. humilis* Pér. mit *T. haliploides* Bates.

Tachys (POLYDERIS Motsch.) *brevicornis* Chaud. ist identisch mit *T. pusillimus* Pér. und dieser ist wieder gleichzusetzen dem *T. minutissimus* Pér. (*rhodesianus* Csiki). Das Tier der "Mittelmeerländer" reicht also bis nach Südafrika. Aber damit ist die Verbreitung kaum erschöpft, denn ich kann den amerikanischen *T. lævus* Say (*troglydites* Dej.) von *T. brevicornis* nicht sicher trennen!

Tachys emeritus Pér. unterscheidet sich von dem jüngst beschriebenen *T. priesneri* Schatzm. von Meadi (Cairo) nur durch die viel stärkeren Punkstreifen der Flügeldecken.

Tachys arrogans Pér. ist mit *T. cardioderus* Chaud. zu vergleichen.

Tachys vicarius Pér. dürfte mit *T. iridipennis* Chaud. identisch sein.

XL.—*Pseudocandona elongata*, a new Species of Ostracod.
By P. F. HOLMES. (From the Zoological Laboratory,
Cambridge.)

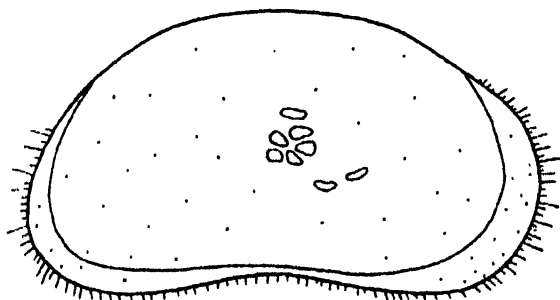
Pseudocandona elongata, sp. n.

Adult Female.

Length 1.02 mm. ; height 0.53 mm. ; breadth 0.46 mm.

Seen laterally the animal is oblong-reniform in shape, with the greatest height about the middle. The exact shape of the shell varies somewhat, but usually in full-grown specimens the greatest height is equal to more than half the length. Young forms may appear more elongated and the greatest height be less than half the

Fig. 1.



Female. Right valve seen from outside.

length (compare figs. 1 and 4). The dorsal margin is gently arched and slopes steeply behind and more gradually in front. The anterior end is broadly rounded and the posterior rather pointed. The left valve overlaps the right slightly at both ends and ventrally, and also in the antero-dorsal region. Due to this the left valve differs somewhat in shape from the right, especially in being broader in the antero-dorsal region. The ventral margin of both valves is distinctly sinuate, but this is more marked in the right than in the left valve (figs. 1 and 2).

Seen dorsally the animal is oval in outline, with the greatest breadth about the middle and equal to less than half the length. The left valve overlaps the right at both ends. The anterior end is more pointed than the posterior and is rather beak-like. The marginal area of the shell is quite well marked at both ends (fig. 3).

Fig. 2.

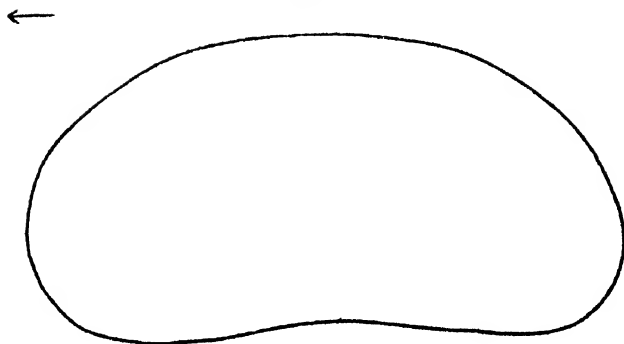


Fig. 3.

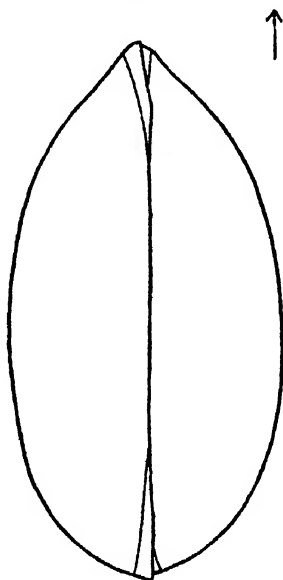


Fig. 2.—Female. Left valve seen from outside.
Fig. 3.—Female. Whole animal seen dorsally.

Seen ventrally the left valve overlaps the right at both ends and in the mid-ventral region where both valves appear slightly convex. The hyaline marginal area is sparsely striated.

Seen from the inside the inner duplicatures are narrow and broadest anteriorly.

Colour white and translucent by transmitted light, with parts of the body showing through the valves as yellow-coloured.

The shell-valves possess numerous hairs at both ends and along the ventral margin. There are also a few large scattered hairs over the rest of the valves, indicated as dots in fig. 1. The integument in adult specimens is seen under the high power to be finely mottled and divided up into irregular areas in a similar way to that figured for *Pseudocandona pubescens* (Koch) by Lowndes (1931, fig. 71).

Appendages.

The *anterior antennæ* are rather short and relatively stout. Thus the third, fourth, and fifth joints are all as broad as they are long, or broader, and the seventh joint is only $2\frac{1}{2}$ times as long as it is broad. The *posterior antennæ* are typical, though the penultimate joint is rather short and stout. The outer edge of the palp of the *maxilliped* is not smooth, but bears a number of widely separated notches. This was noted also by Lowndes for *Pseudocandona pubescens*. The first joint of the terminal part of the *first foot* and the succeeding joint possess a row of conspicuous setæ on their lateral edges. The teeth of the terminal claw are very inconspicuous (fig. 10).

The penultimate joint of the *second foot* is distinctly subdivided and the terminal joint bears three setæ. The shortest of these setæ is about the same length as the seta on the terminal part of the penultimate segment (fig. 11). The *caudal rami* are rather short and distinctly bent. The terminal claws are not subequal and the longer one is slightly less than half the length of the ramus. Each claw bears a proximal and a distal row of teeth. The dorsal seta is situated at some distance from the end of the ramus, and is as long as the shorter terminal claw (fig. 12).

Fig. 4.

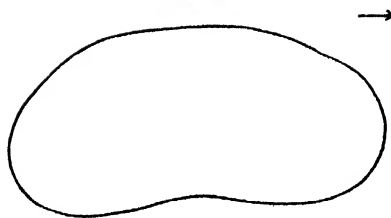


Fig. 5.

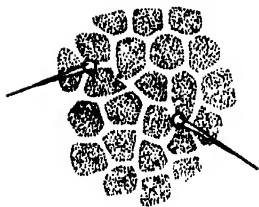


Fig. 6.

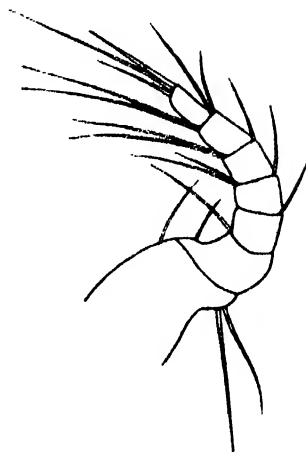


Fig. 7.

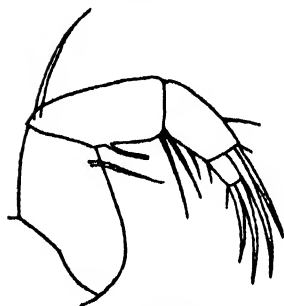


Fig. 8.



Fig. 9.



Fig. 4.—Young form. Right valve seen from outside.

Fig. 5.—Integument under high power.

Fig. 6.—Anterior antenna.

Fig. 7.—Female. Posterior antenna.

Fig. 8.—Male. Maxilliped, right prehensile palp.

Fig. 9.—Male. Maxilliped, left prehensile palp.

Fig. 10.

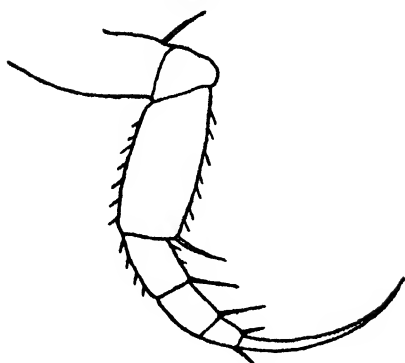


Fig. 11.

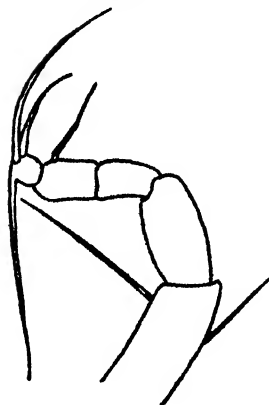


Fig. 12.

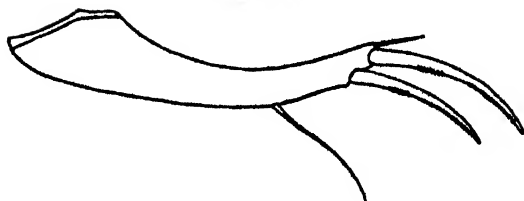


Fig. 10.—First foot.
Fig. 11.—Second foot.
Fig. 12.—Caudal ramus.

Adult Male.

Length 1.13 mm. ; height 0.6 mm. ; breadth 0.52 mm.

The male is almost identical with the female in general appearance, but it reaches a slightly larger size. The posterior antennæ are identical with those of the female in all the specimens which I have examined, and there is no sign of the subdivision of the penultimate joint nor of the two aesthetes which are such typical characters of the males of the genus *Candona*. The right prehensile palp of the maxilliped is larger than the left, but they are both of similar shape. The two claws of each palp are rather short and stout, and the dactylar part bears two spinules at its tip.

I have examined many males from Lake Windermere and also from Lake Ohrid, in south Yugoslavia, and the genital and copulatory apparatus in all of them seems to be very rudimentary. In no specimens have I found any trace of the ejaculatory tubes, which are usually very conspicuous in an adult male Ostracod, even without dissection. The copulative appendages are also little developed, consisting of two simple backwardly projecting lobes. These lobes are not nearly so strongly chitinized as are the copulative appendages of a typical male Ostracod, and very little internal structure can be distinguished in them.

Occurrence.—Both sexes were fairly numerous in mud dredged from about 3 metres in Low Wray Bay, in the North Basin of Windermere, August 1936. In the particular area that was dredged the following plants may be present between 2 and 4 metres :—*Littorella lacustris*, *Isoëtes lacustris*, *Nitella* spp., *Potamogeton perfoliatus*, and a few scattered plants of *Elodea canadensis* and of deeper-living *Potamogeton* spp. (see Pearsall, 1920); but I have not ascertained whether the species is confined to such a habitat in Windermere.

I have also found identical specimens in Lake Ohrid, in the south-west of Yugoslavia, in August 1935; they were obtained from mud dredged from about 10 metres in an area where *Chara* sp. was growing. The species also occurred a few miles distant from the lake, in the stream from a large rheocrene spring near Resan, on the Ohrid-Bitolj road; it was amongst moss and other

vegetation a few feet below the source, together with *Candona neglecta* Sars, *Potamocypis zschokkei* (Kaufmann), and *Ilyodromus olivaceus* (Brady & Norman).

It is remarkable that this new species should have been found in two localities so widely separated as Windermere and Ohrid. In the samples from both lakes males were more numerous than females, but sufficient specimens have not been collected for this to be significant.

Remarks.

Confusion over the genus *Pseudocandona* Kaufmann has been cleared up by Lowndes (1931), who has described in full *Pseudocandona pubescens* (Koch), which hitherto has been the only known species of the genus. Mr. A. G. Lowndes has kindly examined specimens of this new species for me, and agrees with my diagnosis. The main characteristics distinguishing this genus from the genus *Candona* are the lack of subdivision of the penultimate joint of the posterior antennæ of the male and the absence of the typical æsthetes on this appendage. Both these characters are absent in all the males I have examined, and so there can be no doubt that the species belongs to the genus *Pseudocandona*.

The species is obviously distinct from *Pseudocandona pubescens* (Koch). Thus the shape and relative dimensions of the shell of the two species are quite different, and certain of the appendages, such as the anterior antennæ, the palps of the male maxillipeds, and the caudal rami are distinct. The rudimentary condition of the copulatory apparatus in the males of *Pseudocandona elongata* is interesting. The specimens appear to be mature, since the prehensile palps of the maxillipeds are fully developed. Also it is unlikely that all the males would be immature when many of the females contained ripe ova. Thus it seems probable that this is an example of a species in which the male sex continues to exist in spite of the rudimentary condition of the copulatory apparatus. It is hoped to carry out breeding experiments on specimens from Windermere to establish this point. In many species of Ostracods males are unknown, and in the same genus (ex genus *Candona*) some species may possess males while others do not. Lowndes (1935) has recently discussed the extreme specialization of the sperm and male

organs of the freshwater Ostracoda, and he suggests that the complicated and very long sperm may be non-functional, and that true fusion of nuclei may not take place in the reproduction of these Ostracods at all. As evidence that coition continued to take place long after syngamy ceased he cites the prevalence of the enormous spermathecal duct in certain species which reproduce exclusively by parthenogenesis and in which males are unknown. In some species, then, the males have become extinct, while in others they have survived and copulation occurs, although possibly no actual syngamy takes place. The males of *Pseudocandona elongata* lend some support to this theory. In this species the whole male apparatus is very rudimentary, and copulation and impregnation by the male does not seem possible; yet the males continue to exist in as large numbers as the females. On the other hand, in the other species of the genus, *Pseudocandona pubescens*, normal copulation occurs, and Lowndes (1935) has found active sperm in the spermathecae of females.

It is also worth recording the following species of Ostracods which I collected from Windermere in August 1936 :—

Candona neglecta G. O. Sars.

Cryptocandona vavrai Kaufmann.

Cytherissa lacustris G. O. Sars.

Candona neglecta G. O. Sars.—Both sexes were quite common, on a muddy bottom, from depths of 4–60 metres. The males possess the peculiar structure of the sensory setae on the penultimate joint of the second antenna, described by Kaufmann (1900) and by Lowndes (1931 a). This establishes the species beyond doubt. The males recorded by Lowndes only reached a length of 1.16 mm., but those from Windermere were up to 1.45 mm. long. The species has been recorded from several localities in the British Isles by Brady (1910) and from the Birmingham district by Lowndes, and it is probably more widely distributed than the records show for this country.

Cryptocandona vavrai Kaufmann.—Five specimens were obtained from the same area as *Pseudocandona elongata*. This is only the second record of the species for the

British Isles. It was first recorded in this country from the Birmingham district by Lowndes (1931 a).

Cytherissa lacustris G. O. Sars.—One specimen was obtained from mud dredged from about 60 metres. The species has not been recorded from the Lake District before.

In conclusion, I should like to thank Mr. A. G. Lowndes for examining specimens of *Pseudocandona elongata* for me and for his advice.

REFERENCES.

- (1) BRADY, G. S. 1910. "A Revision of the British Species of Ostracod Crustacea, Candoninae and Herpetocypridinae." Proc. Zool. Soc. London, p. 199.
- (2) KAUFMANN, A. 1900. "Cypriden und Darwinuliden der Schweiz." Revue Suisse de Zoologie, vol. viii, p. 389.
- (3) LOWNDES, A. G. 1931. "Some Rare and Little-known British Fresh-water Ostracods." Rep. Marlborough College Nat. Hist. Soc. no. 79, 1930, pp. 82-112.
- (4) LOWNDES, A. G. 1931 a. "Some Fresh-water Entomostraca of the Birmingham District." Ann. & Mag. Nat. Hist. ser. 10, viii, pp. 561-577.
- (5) LOWNDES, A. G. 1935. "The Sperms of Freshwater Ostracods." Proc. Zool. Soc. London, pp. 35-48.
- (6) PEARSALE, W. H. 1920. "The Aquatic Vegetation of the English Lakes." Journ. Ecology, viii, pp. 163-201.

XLI.—*Some new Ephemeroptera.* By D. E. KIMMINS
Department of Entomology, British Museum (Natural History).

[Plate XI.]

THE examples, upon which are based the descriptions of four of the new species in this paper, formed part of a collection bequeathed to the British Museum by the late Rev. A. E. Eaton. With a few exceptions the specimens were collected in the Khasi* Hills district of Assam, but without further indication either of date or of collector. Many of them have suffered from the ravages of time and psocids, etc., but fortunately most species were represented by series of examples. After describing these four species, there remains a residue of females and subimagines which, in the absence of

* The specimens bear the label "Khasia Hills," but I am using the modified spelling given in the Imperial Gazetteer of India, 1931.

males, I have decided to leave unnamed. The subsequent identification of a species described from the female sex only is in many cases a matter of great difficulty and uncertainty, and is liable to cause much confusion.

Unless otherwise stated, all the following species are described from dried pinned material. The figures of the male genitalia have been made from examples which have been cleared in KOH, and before mounting in Canada balsam. The relative lengths of the tarsal segments were measured with an eyepiece micrometer, the segments attached to the tibia being quoted first.

Ephemera zettana, sp. n. (Pl. XI. fig. 1; text-fig. 1.)

Subimago (preserved in formalin).—Wings light warm sepia-grey, longitudinal veins pale, cross-veins brown, bordered with purplish brown. Pronotum sepia-brown, disc of mesonotum whitish, with a dark brown, sagittate patch occupying the anterior half; lateral margins of notum jet-black, whitish posteriorly. Abdomen bright reddish brown.

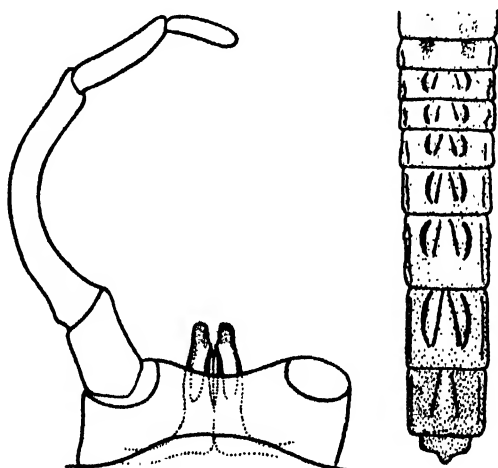
Imago ♂ (in formalin).—Eyes purplish black. Thorax above dark brown, pronotum sepia-brown. Anterior legs reddish or yellowish brown, tips of the femora and of the tarsal segments blackish. Median and posterior legs whitish, marked with blackish brown on the coxæ, trochanters, bases and apices of femora, bases of tibiæ, and tips of tarsal segments.

Abdomen reddish brown, darker apically, and paler beneath, marked with brownish-black. The dorsal markings (text-fig. 1) on segments 1–2 are obscure, on 3–8 a divergent streak on each side of the dorsal vessel, and outside each streak a lunate spot of about the same length ($\frac{1}{2}$ to $\frac{3}{4}$ of the length of the segment), and a sinuous line near each lateral margin. Segment 9 without the lunate spots, 10 unmarked. Segments 2–8 ventrally with a pair of streaks, bent inwards at right-angles at their bases. Forceps base (text-fig. 1) brownish, forceps whitish or yellowish, faintly shaded with brown. Third and fourth segments together more than half the length of the second. Lobes of the penis of the usual *Ephemera* type, scarcely differing from those of *E. danica* Müll. Setæ yellowish, with darker annulations.

Wings (Pl. XI. fig. 1) throughout brownish hyaline, veins and cross-veins dark brown and bordered with dark brown. The costal and subcostal areas of front wing are of a darker shade than the remainder of the wing, and there is a dark streak at the level of the bulla, and a spot between the branches of the cubitus, towards the base of the wing. Apical and posterior margin of the hind wing broadly margined with brown.

♀ similar, the membrane of the wings paler, thus throwing the venation into greater contrast. Abdomen brighter red-brown than the ♂.

Fig. 1.



Ephemerella zettana, sp. n. ♂.

Genitalia from beneath, and diagram of abdominal markings.

Length of body, ♂ 16, ♀ 22 mm.; wing, ♂ 17-18, ♀ 21-22 mm.

MONTENEGRO, R. Zetta, 1933 (*A. H. Batten Poole*).

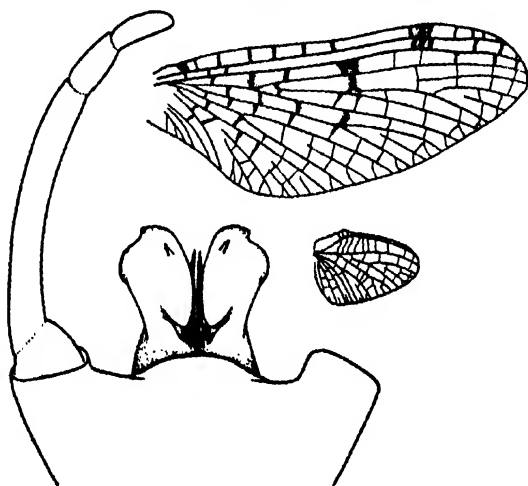
Type ♂, paratypes ♂♀ in the British Museum (Natural History), kindly presented by the collector.

The most noticeable feature of this species is the bright reddish-brown colour of the abdomen. The specimens have been stored in 2 per cent. formaldehyde for about two years and the colour still persists. In answer to an enquiry whether the colour of the insect had been

affected by the collecting-fluid, Mr. Batten Poole writes :—"The mayflies start with an olive brown body, but as the season advances, this assumes a reddish tinge, while the spent Gnat has an entirely crimson body."

The pattern of the abdominal markings recalls that of *glaucoptis*, but the greater size, colour of the abdomen and wings, and proportions of the segments of the forceps of *E. zettana* should separate it from *glaucoptis*. From *E. danica*, which it resembles in the proportions of the forceps, it may be separated by the colour and pattern of the abdomen.

Fig. 2.

*Afronurus njalensis*, sp. n. ♂.

Genitalia from beneath, and wings.

Afronurus njalensis, sp. n. (Fig. 2.)

♂.—Turbinate eyes black. Thorax piceous, marked laterally with pale yellowish. Legs pale, banded with blackish at midway and apex of femur, and near the base, midway, and at apex of tibia. Tarsus of anterior leg slightly longer than tibia, segments in proportions 7, 10, 10, 6, 5. Hind tarsus three-fifths as long as tibia, segments in proportions 4, 3, 3, 2, 3. Abdominal segments 2-8 pale yellowish above, marked with piceous, as follows:—A median and two lateral longitudinal stripes,

extending the whole length of each segment, and joined to a transverse apical band. This band is expanded at the posterior lateral angles and, together with one of the lateral stripes and a triangular patch on the anterior margin, encloses a yellowish mark in the form of a 7. Tergites 9-10 largely piceous. Sternites 1-6 pale, with a triangular piceous spot in each anterior lateral angle, 7-9, largely piceous. Forceps-base dark, forceps whitish (text-fig. 2). Setæ whitish, joints of alternate segments black. Lobes of the penis rounded, shallowly excised apically, and each bearing a small spine. No teeth on the forceps-base, which is produced at the centre of its margin in a broad rounded lobe. Wings hyaline, marked with brown (text-fig. 2). In the hind wing *Rs* separates from *R* further from the base than in *A. harrisoni* Barnard.

♀.—Resembling the ♂, but body somewhat paler, wings more strongly marked. Ventral plate rounded, entire.

	mm.	mm.
Length of anterior wing	♂ 9,	♀ 10
„ body	♂ 9,	♀ 9
„ setæ	♂ 19,	♀ 17

Type ♂, Sierra Leone, Njala, 9. xi. 30 (*E. Hargreaves*) ; ♂♀ paratypes, Njala, x-xi. 30, x. 31, iii. 32, ix. 32, iii. 34 (*E. Hargreaves*) ; 1 ♂, Uganda, Rogem, 21. ix. 33 (*G. H. E. Hopkins*).

Type and paratypes in the British Museum of Natural History, presented by the Imperial Institute of Entomology.

I think that on some future occasion it may be necessary to erect a new genus for this species as it differs in several respects from Lestage's diagnosis of *Afromurus*. For instance, the ♂ anterior tarsus is slightly longer than the tibia, not $\frac{1}{2}$ shorter ; the hind tarsus is $\frac{1}{2}$, not $\frac{1}{3}$ shorter than the tibia. The lobes of the penis are formed after the pattern of *Heptagenia*, but *A. njalensis* differs from that genus in the proportions of the tarsal segments of both anterior and posterior legs. At present, however, as there are so few representatives of the family Ecdyonuridæ known from Africa, I am unwilling to add to the number of genera.

CINYGMINA, gen. nov.

♂.—First segment of the anterior tarsus $\frac{1}{4}$ of the length of the second, which is longer than the third. Anterior tarsus $1\frac{1}{2}$ times as long as tibia. First segment of posterior tarsus longer than second. No forked cross-veins in pterostigma of anterior wing. Lobes of the penis rounded apically, not dilated laterally as in *Ecdyonurus*; genital stimuli much reduced, represented by a pair of small, thin, chitinous plates. Venation of the usual Heptagenine type.

Genotype: *C. assamensis*, sp. n.

This genus appears to be most closely related to *Cinygma* Eaton, from which it is distinguished by the different proportions of the ♂ anterior tarsal segments, the relative lengths of the anterior tarsus and tibia, and the greater reduction of the genital stimuli. According to Mr. McDunnough's figure of the genitalia of *Cinygma integrum* Eaton (the genotype) in *Canad. Ent.* 1926, lviii. pl. iii. fig. 10, the stimuli are shown as small spines, whereas in the present genus they are reduced to thin chitinous plates. From *Ecdyonurus* it may be separated by the form of the penis lobes, and the reduction of the stimuli; from *Epeorus* and *Iron* by the proportions of the anterior tarsal segments of the ♂, and from *Heptagenia* by the relative lengths of the posterior tarsal segments.

Cinygmina assamensis, sp. n. (Fig. 3.)

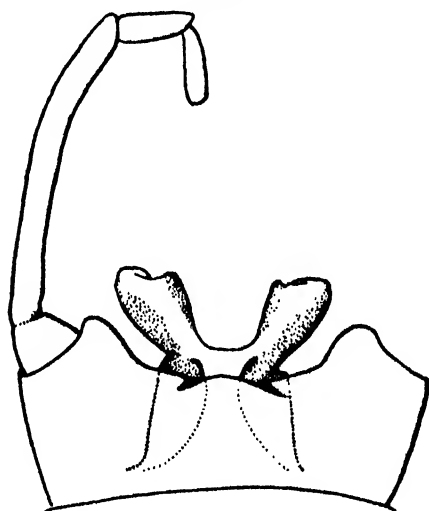
Subimago ♂.—Wings pale greyish cream, costal and apical margins of anterior wing shaded with darker grey. Veins almost colourless, costa, subcosta, and radius slightly greyish, and a black spot at the junction of the subcosta and great cross-vein.

♀.—Wings yellowish, with faint fuscous shading. Venation fuscous. Body in both sexes ochraceous.

Imago ♂.—Head and eyes light reddish brown. Thorax above yellowish brown, paler centrally; sides and beneath yellowish. Legs yellowish brown, apices of femora brownish. Relative lengths of anterior tarsal segments 8:14:10:5:5, of posterior tarsus 10:9:7:5:12. Abdomen yellowish, with a median dorsal stripe of reddish brown on segments 1-9, occupying about one-half of the width of each segment. Within this stripe,

there is on segment 2 a pair of right-angled triangular yellow spots, and on segments 3-8 a pair of reniform yellow spots. Setæ yellowish, becoming fuscous apically, joints of alternate segments slightly fuscous. Forceps and base yellowish. The latter with its apical margin expanded at the sides and raised and produced at its centre. Lobes of the penis, after treatment with KOH, slightly divergent, a little dilated towards their apices, and a wide U-shaped excision between them. No spines on the lobes. Penis with a constriction at the

Fig. 3.

*Cinygmmina assamensis*, gen. et sp. n. ♂.

Genitalia from beneath.

point from which the lobes diverge. Wings hyaline, venation pale, almost colourless, except the part of the great cross-vein touching the subcosta, which is brown.

♀.—Similar in colouring, costal and subcostal areas of anterior wing faintly tinged with yellowish. Alternate joinings of setæ darker than in ♂.

Length of body, ♂ 8, ♀ 9; of anterior wing, ♂ 10, ♀ 13; of setæ, ♂ 23, ♀ 20 mm.

ASSAM: Khasi Hills (*Eaton Bequest*).

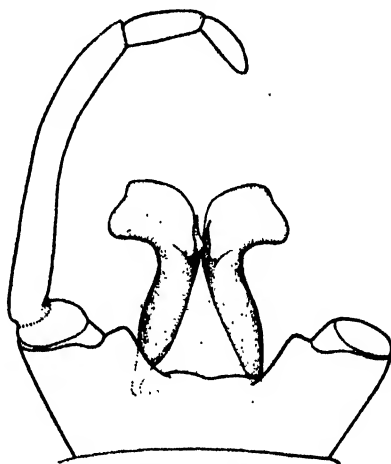
Type ♂, paratypes ♂ and ♀, imagines and subimagines in the British Museum collections.

Heptagenia nubila, sp. n. (Pl. XI. fig. 2; text-fig. 4.)

Subimago.—Wings greyish, venation dark brown, cross-veins heavily bordered with brown. Body black-brown, with yellowish markings.

Imago ♂.—Head yellowish brown, eyes black. Thorax above brownish or yellowish brown, sides brown, with yellow markings. Femora yellowish brown, with the apices and also two rings dark brown; anterior tibia and tarsus dull brownish; median and posterior tibiae and tarsi dull yellowish. Relative lengths of anterior tarsal segments 3:19:18:13:6. Tarsus $1\frac{1}{2}$ times as

Fig. 4.



Heptagenia nubila, sp. n. ♂.

Genitalia from beneath.

long as tibia. Posterior tarsus with the first segment shorter than second. Abdominal segments 1–8 yellow above, apical and basal margins dark brown; these margins are much extended on segments 4–5. Segments 9–10 entirely brown above. Ventral segments yellowish, becoming fuscous on segments 8–9. Setæ dull yellow-brown, with darker annulations. Forceps and base pale fuscous. Apical margin of the forceps-base produced at the sides, leaving a wide excision at the centre. Segment 2 of the forceps constricted at its base. Lobes of the penis unarmed, apices dilated outwards and

somewhat truncate; stimuli of medium size, situated on the median line. Wings hyaline, with brown markings fringing the cross-veins as in Pl. XI. fig. 2; venation brown. Hind wing more elongate than is usual in *Heptagenia*.

♀ similar, body markings more defined.

Length of body, ♂ and ♀, 8; of wing, ♂ $8\frac{1}{2}$, ♀ 10 mm.

ASSAM, Khasi Hills (*Eaton Bequest*).

Type ♂, paratypes ♂ and ♀, and subimagines in the British Museum collections.

Ecdyonurus eatoni, sp. n. (Pl. XI. fig. 3; text-fig. 5.)

Subimago.—Anterior wings (Pl. XI. fig. 3), fuscous, with three or four transverse pale streaks in the distal half, caused by pale areas in the centres of cells. Costal and subcostal areas (by transmitted light) yellowish, pterostigma dark fuscous. Venation dark brown. Hind wing fuscous, excepting costal and subcostal areas towards the base, which are yellowish. Body fuscous, legs marked as in imago.

Imago ♂.—Eyes black, thorax above shining dark castaneous. Legs yellowish brown, femora with a ring midway and the apices dark castaneous. Apices of anterior tibiae also castaneous. Anterior tarsus about one and a quarter times as long as tibia. Proportions of anterior tarsal segments, 6:15:14:9:5½. Abdominal tergite 1 reddish brown; 2–6 ochreous, marked with rich reddish brown as follows:—Apical and basal margins; a narrow median triangle, arising from the base and extending about three-quarters of the length of each tergite; an oblique lateral stripe linking apical and basal margins; and the apical lateral angles. On tergites 7–9 the reddish-brown marks are more extensive, and almost obliterate the pale ground. Tergite 10 ochraceous. Sternites pale ochraceous. Setae fuscous, with darker joints to the segments. Forceps and base ochraceous. Forceps-base with a strong tooth on each side, margin between the teeth slightly produced. Penis-lobes rounded apically, somewhat as in *E. lateralis* Curt. Stimuli short and curved. Wings hyaline, with yellowish-brown venation, costal and subcostal areas of anterior wing yellowish, with a pale fuscous spot at base and apex of pterostigma. Posterior wing yellowish at base of costal area.

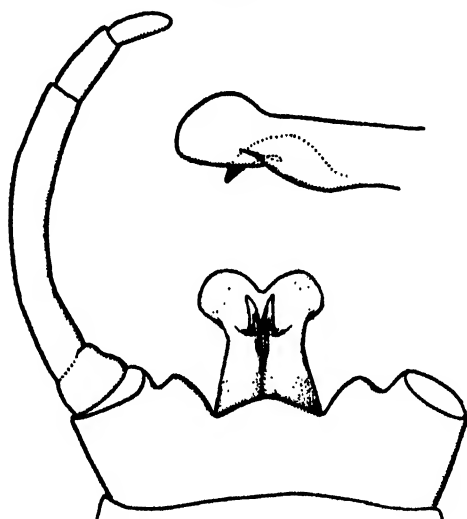
♀ *imago* similar, thorax paler, abdominal markings less distinct.

Length of body, ♂ 9, ♀ 9-11; of anterior wing, ♂ 11, ♀ 12-16; of setæ, ♂♀ 25 mm.

ASSAM, Khasi Hills (*Eaton Bequest*).

Type ♂ *imago*, and paratypes ♂ and ♀, *imagines* and *subimagines*, in the British Museum. Many of the specimens have suffered from the ravages of Psocids.

Fig. 5.



Ecdyonurus eatoni, sp. n. ♂.

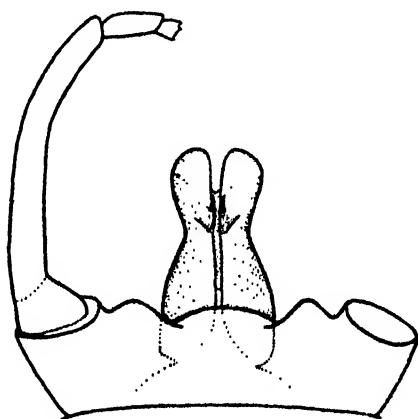
Genitalia from beneath, and penis-lobes, from side, more enlarged.

Ecdyonurus subfuscus, sp. n. (Fig. 6.)

Imago ♂.—Head dark brown, eyes black. Thorax above light brown, sides rather more yellowish. Femora yellow-brown, with their bases, apices, and a median ring on each, dark brown. Tibiæ yellow-brown, with their extreme apices dark brown. Tarsi pale yellow-brown, apices of each segment darker. Anterior tarsus $1\frac{1}{2}$ times as long as tibia, relative lengths of tarsal segments 13:19:16:12:5. Abdomen pale yellow-brown, segments 2-8 above marked with dark purplish brown as

follows:—A narrow median dorsal stripe; the apical margin; the apical $\frac{3}{4}$ of the lateral margin; and an oblique lateral stripe rising from just above the anterior lateral angle towards the dorsal stripe. Setæ pale, with darker annulations on alternate joints. Forceps-base pale yellow-brown, forceps pale fuscous. Forceps-base toothed (text-fig. 6), terminal segment of forceps damaged in the type. Lobes of the penis obovate, more slender and elongate than in *E. lateralis* Curt., stimuli small and strong, down-curved. Wings hyaline, faintly suffused with yellowish brown, cross-veins in the

Fig. 6.

*Eodyonurus subfuscus*, sp. n.

Genitalia from beneath.

costal and subcostal areas, and between the radius and sector, bordered with brownish. Cross-veins in the pterostigma simple.

♀ similar in colouring, rather larger.

Length of body, ♂ 7, ♀ 8; of anterior wing, ♂ 8, ♀ 11 mm. ASSAM, Khasi Hills (*Eaton Bequest*).

Type ♂, paratypes ♀♀ in the British Museum collections.

EXPLANATION OF PLATE XI.

Fig. 1. *Ephemera settana*, sp. n. Wings of imago. $\times 4.4$.

Fig. 2. *Heptagenia nubila*, sp. n. Wings of imago. $\times 10$.

Fig. 3. *Eodyonurus eatoni*, sp. n. Wings of subimago. $\times 7$.

XLII—*New Species and Records of Mutillidæ (Hymenoptera) from Borneo and the Solomon Islands* *. By CLARENCE E. MICKEL, University of Minnesota.

THE Mutillidæ described and recorded herein are the results of the collecting of the Oxford University Expedition to Sarawak in 1932, of Mr. G. E. Bryant in Sarawak in 1913 and 1914, and of Mr. H. T. Pagden in the Solomon Islands in 1933 and 1934. A general account of the work of the Oxford University Expedition to Sarawak has been given by T. H. Harrison (1933), and some of the ecological results of the Expedition have been reported by P. W. Richards (1936). G. E. Bryant (1919) gives an interesting account of his collecting experiences in Sarawak and the localities where he collected. H. T. Pagden collected a large number of Hymenoptera during the period of his residence in the Solomon Islands, and sent the Mutillidæ to me from time to time for study. Complete historical and synonymical references for all the previously described species mentioned herein, together with keys for their identification, are to be found in a paper by Mickel (1935).

I am indebted to Dr. B. M. Hobby for the opportunity of studying the Mutillidæ of the Oxford University Expedition to Sarawak, to Mr. R. B. Benson and the British Museum (Natural History) for the privilege of studying Mr. G. E. Bryant's material and for assistance in comparison of specimens, and to Mr. H. T. Pagden for his interest and kindness in collecting and sending to me Mutillid specimens from the Solomon Islands.

Family Mutillidæ.

Genus *Squamulotilla* Bischoff.

Squamulotilla calliopeia Mickel.

♂, Lundu, Sarawak, January 6, 1914 (*G. E. Bryant*).

Squamulotilla clypealis Mickel.

♂, Sarawak, November 28, 1913 (*G. E. Bryant*).

* Paper No. 1452 of the 'Scientific Journal Series of the Minnesota Agricultural Experiment Station.'

Squamulotilla venatrix Mickel.

2 ♀♀, Mt. Matang, W. Sarawak, December 6, 1913, and January 30, 1914 (*G. E. Bryant*).

Genus ODONTOMUTILLA Ashmead.

Odontomutilla familiaris familiaris (Smith).

♀, Lundu, Sarawak, January 5-9, 1914 (*G. E. Bryant*) ;
 ♀, Mt. Merinjak, Sarawak, May 26, 1914 (*G. E. Bryant*) ;
 ♀, Puak, Sarawak, 1500 ft., May 6, 1914 (*G. E. Bryant*) ;
 ♀, Quop, W. Sarawak, March 2, 1914 (*G. E. Bryant*) ;
 ♂, Mt. Matang, Sarawak, December 27, 1913, 2000 ft. (*G. E. Bryant*) ; ♀ and 2 ♂♂, Kapah river, tributary of Tinjar river, Sarawak, October 5, 6, & 7, 1932 (*B. M. Hobby* and *A. W. Moore*) ; ♂, Mt. Dulit, Koyan river, Sarawak, November 21, 1932, 2500 ft., primary forest (*B. M. Hobby* and *A. W. Moore*).

Odontomutilla thymele Mickel.

♀, Puak, Sarawak, May 2, 1914 (*G. E. Bryant*).

Genus TIMULLA Ashmead.

Subgenus TROGASPIDIA Ashmead.

Timulla (Trogaspidia) cydippe Mickel.

7 ♂♂, Mt. Matang, W. Sarawak, November 2, 1913, December 2, 5, 6, & 20, 1913, January 29, 1914, and February 25, 1914 (*G. E. Bryant*).

Timulla (Trogaspidia) erato Mickel.

2 ♂♂, Mt. Matang, W. Sarawak, December 18, 1913, and January 21, 1914, 2000 ft. (*G. E. Bryant*) ; ♂, Lundu, Sarawak, January 5-9, 1914 (*G. E. Bryant*) ; ♂, Mt. Dulit, Sarawak, Dulit trail, October 6, 1932, primitive forest (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) suspiciosa suspiciosa (Smith).

♂, Kapah river, tributary of Tinjar river, Sarawak, October 9, 1932 (*B. M. Hobby* and *A. W. Moore*) ; ♂, Mt. Dulit, Sarawak, October 17, 1932 (*B. M. Hobby* and *A. W. Moore*) ; ♂, Mt. Dulit, Sarawak, October 17, 1932, 4000 ft., moss forest (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) sibylla (Smith).

♀, Quop, W. Sarawak, February 26, 1914 (*G. E. Bryant*).

Timulla (Trogaspidia) shelfordi Mickel.

♂, Mt. Kalulong, Sarawak, November 1, 1932, 400–650 ft., primitive forest, on boulders in torrent (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) scapus, sp. n.

♂.—Black, except first tergite posterior to the anterior margin, second and third segments entirely, and anterior half of fourth tergite, all ferruginous; clothed more or less with pale pubescence except the mesonotum, anterior half of scutellum and last two abdominal segments clothed with black pubescence; median area of clypeus glabrous, with a median longitudinal ridge, the posterior half of the ridge obsolete, the anterior half elevated into a conspicuous median glabrous subhemispherical elevation; distal half of scape conspicuously dilated and flattened, strongly bicarinate beneath, the parallel carinæ close together, each carina forming the margin of the ventral aspect of the scape, the ventral aspect thus narrow and sulcate; lateral ridges of hypopygium not widely separated. Length, 17 mm.

Head entirely black, clothed with sparse erect pale glittering pubescence, except the anterior half of front and lateral areas of clypeus with thick appressed pale glittering pubescence as well, and the ocellar area with a few erect fuscous hairs; mandibles moderately robust, deeply excised beneath near the base forming a prominent tooth, edentate at the apex and with a distinct tooth within the apex; clypeus as described above; distal half of scape strongly dilated and flattened as described above; first segment of flagellum slightly longer than the second; front with moderately large, more or less confluent punctures; vertex with moderate separated punctures, closer towards the hind margin of the head than behind the ocelli; genæ with moderate dense punctures; relative width of head and thorax at the tegulæ, 6.1 : 6.9.

Thorax entirely black, clothed with pale glittering pubescence, except the mesonotum and anterior half

of scutellum with sparse black pubescence, the pale pubescence dense on the median areas of the mesopleuræ, sparse elsewhere; pronotum with coarse confluent punctures; mesonotum with large, deep, mostly distinct, close punctures; parapsidal furrows distinct and deep on posterior half of mesonotum; mesonotum with a narrow median longitudinal glabrous impunctate line, the latter broadened at the anterior margin; scutellum strongly gibbose, with large dense punctures and the dorsal surface with a broad median longitudinal glabrous impunctate line; dorsum and posterior face of propodeum broadly reticulate, separated medially by a transverse crenulate ridge; enclosed space of dorsum of propodeum elongate slightly elevated posteriorly into a small tubercle; anterior third of enclosed space broad, the posterior two-thirds narrow and with the sides parallel; propleuræ longitudinally rugose, the anterior margin defined by a carina; ventral and dorsal areas of mesopleuræ elevated, the two areas separated by a furrow and both with large dense confluent punctures; anterior and posterior areas of mesopleuræ micropunctate; metapleuræ micropunctate except for a few shallow punctures ventrally; sides of propodeum micropunctate, except the posterior third broadly and shallowly reticulate; tegulæ large, glabrous, impunctate except the anterior and inner margins punctate and black pubescent.

Abdomen black, except the first tergite posterior to the anterior margin, the second and third segments entirely and the anterior half of the fourth tergite all ferruginous, clothed with sparse pale pubescence, except the segment posterior to the fifth clothed with sparse black pubescence; first tergite with large sparse punctures except the posterior margin with small distinct close punctures; disk of second tergite glabrous, almost impunctate, the lateral thirds of the tergite with moderate distinct punctures, and the posterior fifth slightly depressed and with small scattered punctures; tergites three to five with small sparse punctures; last tergite with a broad median tumescent glabrous area, rounded off posteriorly; lateral areas of last tergite with small close punctures; first sternite with a median longitudinal carina on the anterior two-thirds, the carina elevated posteriorly to form a small tooth, the carina

viewed in profile broadly shallowly emarginate; second sternite with large sparse shallow punctures, except the posterior margin with the punctures smaller; sternites three to six with moderately small punctures posteriorly; sternite seven very obscurely tuberculate at the posterolateral angles, hypopygium with thick erect black pubescence medially and posteriorly, more or less obscuring the hypopygial ridges.

Wings fuscous, paler on the proximal third; cell 2nd $R_1 + R_2$ squarely truncate at the apex; cell R_4 present, but not as well developed as R_5 , receiving vein M_2 slightly beyond the middle; cell R_5 receiving vein M_{3+4} at three-fifths the distance from base to apex; vein $m-cu$ terminating distinctly anterior to vein $M_4 + Cu_1$.

Legs entirely black, clothed with sparse pale pubescence; calcaria pale.

Holotype.—♂, foot of Mt. Dulit, junction of rivers Tinjar and Lejok, Sarawak, Borneo, October 5, 1932 (at light trap) (*B. M. Hobby* and *A. W. Moore*), in British Museum (Natural History).

Paratypes.—2 ♂♂, River Kapah tributary of River Tinjar, Sarawak, Borneo, October 10, 1932, on door post of house (*B. M. Hobby* and *A. W. Moore*); ♂, River Kapah, tributary of River Tinjar, Sarawak, Borneo, October 7, 1932, in clearing (*B. M. Hobby* and *A. W. Moore*).

Very similar to *shelfordi* Mickel, the coloration being almost exactly the same except that *scapus* has more of the fourth abdominal tergite ferruginous; the median area of the clypeus is very similar in the two, in *scapus* the anterior elevation of the median area is evenly rounded throughout, while in *shelfordi* the elevation is abrupt anteriorly; the outstanding and conspicuous difference is in the character of the scape, it being normal for the genus in *shelfordi*, while in *scapus* the distal half of the scape is broadly expanded and flattened so that the ventral carinae form the margins of a narrow, ventral face. The pronotum and mesonotum are more coarsely sculptured in *scapus* than in *shelfordi*. The genitalia of the two species have been examined and are conspicuously different. The relationship of the two species interpreted on the basis of genitalia is more distant than if interpreted on external characters alone.

Timulla (Trogaspidia) bryanti, sp. n.

♀.—Head, abdomen, and legs black, except the antennal tubercles ferruginous, the thorax entirely ferruginous; second abdominal tergite with a pair of anterior circular pale pubescent spots, the distance between them equal to their diameter; third and fourth tergites with a broad band of dense appressed pale pubescence, that on the third narrowly interrupted medially with black, that on the fourth broadly interrupted medially with black; pygidial area longitudinally striated on anterior two-thirds, unsculptured on posterior third. Length 9.5 mm.

Head entirely black, except antennal tubercles ferruginous, clothed with sparse short pale glittering pubescence, except the front and vertex with sparse black pubescence; mandibles edentate at the tip and with a small tooth within remote from the tip; antennal scrobes strongly carinate above; front, vertex, and genæ with moderate dense confluent punctures; relative widths of head and thorax, 4.0–3.7 mm.

Thorax entirely ferruginous, clothed with sparse inconspicuous pale pubescence, except the dorsum with very sparse erect and suberect blackish pubescence; humeral angles angulate but not conspicuous; mesonotal area slightly narrower than the pronotal or propodeal areas; relative widths at humeral angles, at small tubercles on lateral margin of pronotum, at anterior spiracles, immediately in front of propodeal spiracles, and widest portion of propodeum, 3.4 : 3.7 : 3.4 : 3.2 : 3.6; dorsum of thorax with large dense confluent punctures, the latter becoming deeper and coarser on dorsum of propodeum and merging into the strongly longitudinally rugose posterior face of propodeum; scutellar scale present and distinct; lateral margins of posterior face of propodeum denticulate; pleural areas micropunctate and micropubescent, shining, the sides of propodeum with obscure moderate punctures posteriorly.

Abdomen entirely black, clothed with black pubescence except the second, third, and fourth tergites with pale appressed pubescence as described above, the posterior half of lateral margins of second tergite and distal margins of all the sternites with pale appressed pubescence, the

sternites with fringes of sparse long pale hairs, and the first tergite and lateral margins of pygidial tergite with long erect pale fuscous pubescence; second tergite with moderate separated punctures interspersed with fine close punctures, the moderate punctures visible through the pale appressed pubescence; pygidium as described above; first sternite with a median longitudinal carina on the anterior half, the carina slightly elevated into a tooth at its posterior terminus; second sternite with sparse moderate punctures, the latter becoming close at the posterior margin; sternites three to six with sparse small punctures, the latter becoming close at the posterior margin of each sternite.

Legs entirely black, clothed with sparse pale pubescence throughout; tibial spines ferruginous; calcaria pale.

Holotype.—♀, Mt. Matang, W. Sarawak, Borneo, December 1913 (*G. E. Bryant*), in British Museum (Natural History).

Paratypes.—♀, Mt. Matang, W. Sarawak, Borneo, December 1913 (*G. E. Bryant*); ♀, Mt. Matang, W. Sarawak, Borneo, December 1913–January 1914 (*G. E. Bryant*).

Apparently related to *repræsentans* Smith, but differs in having the pale spots of second tergite smaller than in *repræsentans*; in *bryanti* the distance between the spots equal to their diameter, in *repræsentans* the same distance equal to only four-fifths of their diameter; *bryanti* also differs from *repræsentans* in having the coxæ entirely black, and in the strise of the pygidium being slightly sinuate rather than straight.

Timulla (Trogaspidia) saturnia samawangensis Mickel.

♂, Mt. Matang, Sarawak, December 21, 1913 (*G. E. Bryant*); ♂, Kapah river, tributary of Tinjar river, Sarawak, September 24, 1932, primitive forest (*B. M. Hobby* and *A. W. Moore*); ♂, Mt. Dulit, Sarawak, October 19, 1932, 4000 ft., moss forest (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) hylonome Mickel.

♂, Mt. Matang, Sarawak, January 30, 1914 (*G. E. Bryant*).

Timulla (Trogaspidia) nedyme Mickel.

♂, Mt. Matang, Sarawak, December 10, 1913, 1000 ft. (*G. E. Bryant*).

Timulla (Trogaspidia) olbia Mickel.

4 ♂♂, Mt. Matang, Sarawak, December 4 & 6, 1913, 2000 ft., January 1914 and February 11, 1914, 1000 ft. (*G. E. Bryant*); ♂, Kapah river, tributary of Tinjar river, Sarawak, September 28, 1932 (*B. M. Hobby* and *A. W. Moore*); 4 ♂♂, Mt. Dulit, Sarawak, October 17, 18 & 19, 1932, 4000 ft., moss forest, and October 24, 1932, 3000 ft., moss forest (*B. M. Hobby* and *A. W. Moore*); ♂, Mt. Dulit, Koyan river, Sarawak, November 21, 1932, 2500 ft., primary forest (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) dercetis Mickel.

2 ♂♂, foot of Mt. Dulit, junction of Tinjar and Lejok rivers, Sarawak, September 24, 1932, primitive forest, undergrowth, and October 11, 1932, wet mud (*B. M. Hobby* and *A. W. Moore*); ♂, Kapah river, tributary of Tinjar river, Sarawak, September 24, 1932, primitive forest, undergrowth (*B. M. Hobby* and *A. W. Moore*); ♂, Mt. Dulit, Sarawak, Dulit trail, October 6, 1932 (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) proserpina proserpina (Smith).

Mutilla proserpina Smith, 1858, J. Proc. Linn. Soc., Zool. ii. p. 85, ♀.
Timulla (Trogaspidia) proserpina proserpina Mickel, 1935, Trans. Roy. Ent. Soc. London, lxxxiii. p. 269, ♀.

Timulla (Trogaspidia) fortuita nebulosa Mickel, 1935, Trans. Roy. Ent. Soc. London, lxxxiii. p. 263, ♂. (New synonymy.)

The above synonymy results from the examination of a male and female specimen taken in copula by G. E. Bryant at Quop, Sarawak, February 14, 1914.

♂, Mt. Merinjak, Sarawak, 1500 ft. (*G. E. Bryant*); ♀, Quop, W. Sarawak, March 1914 (*G. E. Bryant*); ♀, Puak, Sarawak, May 1, 1914 (*G. E. Bryant*); ♂, Mt. Kalulong, Sarawak, November 19, 1932, 2500 to 3000 ft., on wet undergrowth, primitive forest (*B. M. Hobby* and *A. W. Moore*); 7 ♂♂, Mt. Dulit, Sarawak, October 16, 18, 19, 22, 26, & 28, 4000 ft., moss forest (*B. M. Hobby* and *A. W. Moore*); 2 ♂♂, Mt. Dulit, Koyan river, Sarawak, October 19, 1932 and November 18, 1932, 2500 ft., primary forest (*B. M. Hobby* and *A. W. Moore*); 2 ♂♂.

Mt. Dulit, Sarawak, October 26, 1932, 4000 ft., moss forest, light trap (B. M. Hobby and A. W. Moore); ♂, foot of Mt. Dulit, junction of Tinjar and Lejok rivers, Sarawak, October 8, 1932, light trap (B. M. Hobby and A. W. Moore).

Timulla (Trogaspidia) proserpina tibiata Mickel.

Timulla (Trogaspidia) proserpina tibiata Mickel, 1934, Philipp. J. Sci. liv. (1) p. 176, ♀.

Timulla (Trogaspidia) fortuita Mickel, 1934, Philipp. J. Sci. liv. (1) p. 181, ♂. (New synonymy.)

Timulla (Trogaspidia) fortuita fortuita Mickel, 1935, Trans. Roy. Ent. Soc. London, lxxxiii. p. 263, ♂. (New synonymy.)

The specimens mentioned just preceding as having been taken *in copula* at Quop, Sarawak, Borneo, demonstrated that *T. (T.) fortuita nebulosa* was the male sex of *T. (T.) proserpina proserpina* Smith. Both of these are represented by subspecies in the Philippine Islands. It is, therefore, logical to conclude that *T. (T.) proserpina tibiata*, ♀, and *T. (T.) fortuita fortuita*, ♂, which was recorded from somewhat the same geographical area in the Philippine Islands, are the two sexes of the same species, resulting in the above synonymy. *T. (T.) proserpina sibuyanensis* is excluded from consideration because the differences between *proserpina proserpina*, and the former are greater than those between *proserpina proserpina* and *proserpina tibiata*, and because the known distribution of *sibuyanensis* is limited to a single island.

Timulla (Trogaspidia) bagrada (Cameron).

9 ♂♂, Lundu, Sarawak, January 5-9, 6, & 7 (G. E. Bryant); ♂, Mt. Merinjak, Sarawak, May 26, 1914, 1500 ft. (G. E. Bryant).

Timulla (Trogaspidia) depressicornis Mickel.

♂, Mt. Matang, Sarawak, December 10, 1913, 1000 ft. (G. E. Bryant); ♂, Mt. Merinjak, Sarawak, May 1914 (G. E. Bryant); 2 ♂♂, Mt. Dulit, Koyan river, Sarawak, November 18 & 21, 1932, 2500 ft., primary forest (B. M. Hobby and A. W. Moore).

Timulla (Trogaspidia) ira ira (Cameron).

3 ♂♂, Kapah river, tributary of Tinjar river, Sarawak, September 25, 1932, and November 8, 1932, old secondary forest (B. M. Hobby and A. W. Moore); 4 ♂♂, foot of

Mt. Dulit, junction of Tinjar and Lejok rivers, August 22, 1932, cultivated land now waste, September 11 & 23, 1932, old secondary forest, and September 24, 1932, undergrowth, primitive forest (*B. M. Hobby* and *A. W. Moore*); ♂, Mt. Kalulong, Tebani river, November 31, 1932, on freshly felled young trees, undergrowth, primitive forest (*B. M. Hobby* and *A. W. Moore*); ♂, Sarawak (*B. M. Hobby* and *A. W. Moore*).

Timulla (Trogaspidia) mamblia (Cameron).

♀, Quop, W. Sarawak, March 2, 1914 (*G. E. Bryant*).

Timulla (Trogaspidia) psecas Mickel.

8 ♀♀, Mt. Matang, W. Sarawak, December 1913, December 6, 1913, January 1914, January 23, 1914, and February 9 & 14, 1914, 1000 ft. (*G. E. Bryant*); 3 ♀♀, Mt. Merinjak, Sarawak, May 22 & 24, 1914, 600 ft. (*G. E. Bryant*); ♀, Quop, W. Sarawak, March 11, 1914 (*G. E. Bryant*); 2 ♀♀, Mt. Dulit, Sarawak, October 19, 1932, 4000 ft., moss forest (*B. M. Hobby* and *A. W. Moore*).

Genus *SMICROMYRME* Thomson.

Smicromyrme runcina (Zavattari).

2 ♂♂, Mt. Matang, Sarawak, December 11, 1913, 2000 ft., and May 14, 1914, 600 ft. (*G. E. Bryant*); ♂, Mt. Dulit, Koyan river, Sarawak, November 17, 1932, 2500 ft., primary forest (*B. M. Hobby* and *A. W. Moore*).

Smicromyrme zavattarii Mickel.

♂, Mt. Matang, Sarawak, December 20, 1913 (*G. E. Bryant*).

Smicromyrme delia Mickel.

♀, Mt. Merinjak, Sarawak, May 24, 1914, 600 ft. (*G. E. Bryant*).

Smicromyrme meator Mickel.

♂, Kapah river, tributary of Tinjar river, Sarawak, September 25, 1932 (*B. M. Hobby* and *A. W. Moore*).

Smicromyrme punctinota Mickel.

♂, Mt. Matang, Sarawak, January 18, 1914 (*G. E. Bryant*).

Smicromyrme petina, sp. n.

♀.—Head and abdomen black, the thorax, legs, mandibles except the tips, antennal tubercles, scape, pedicel, first segment of flagellum, remainder of flagellum beneath, and first sternite, all ferruginous; second tergite with a median longitudinal groove anteriorly; second tergite with a median anterior elongate ovate spot in the median groove, and a narrow band at the posterior margin of dense appressed pale pubescence; third tergite with a broad band of dense appressed pale pubescence; front and vertex with an inconspicuous low median longitudinal carina; scutellar scale present and distinct; pygidial area not defined laterally by a carina, glabrous, unsculptured. Length 6.5 mm.

Head black, with above exceptions, the clypeus and genæ with pale pubescence, the front and vertex with sparse black pubescence; front, vertex, and genæ with moderate dense confluent punctures; antennal scrobes feebly carinate above; relative widths of head and thorax, 3.0 : 2.2.

Thorax entirely ferruginous, the dorsum with sparse dark pubescence, the posterior face of propodeum with sparse long erect pale pubescence, and the pleural areas with sparse short pale pubescence; thorax not narrower posteriorly than anteriorly; dorsum of thorax with large dense confluent punctures merging into the deeply reticulate dorsum of propodeum, the reticulate area extending on to the posterior face of propodeum and the latter becoming longitudinally rugose posteriorly; humeral angles angulate, but not prominent; lateral margins of dorsum of thorax crenulate, subparallel; lateral margins of posterior face of propodeum denticulate; pleural areas glabrous, micropunctate; scutellar scale present.

Abdomen black, except first sternite ferruginous, with pubescent markings as described above; second tergite with a median anterior longitudinal groove, and with large dense deep punctures, the latter becoming distinct and separated laterally, and the posterior margin of the tergite with fine punctures beneath the pale pubescence; pygidial area glabrous, unsculptured, not separated laterally from the punctate areas by a carina; first sternite with a median longitudinal carina; second

sternite with moderate distinct punctures; all the sternites with sparse pale pubescence.

Legs ferruginous, the tibiæ and tarsi somewhat darker than the rest; calcaria pale.

Holotype.—♀, Mt. Matang, W. Sarawak, Borneo, February 12, 1914 (*G. E. Bryant*), in British Museum (Natural History).

Paratype.—♀, Mt. Matang, W. Sarawak, Borneo, December 1913 (*G. E. Bryant*).

Runs to *decora* Smith in the key to *Smicromyrme* (Mickel, 1935). The following couplet will separate the two :—

- | | |
|--|------------------------|
| Thorax distinctly narrower posteriorly than anteriorly; second abdominal tergite without a median longitudinal groove anteriorly; first abdominal segment ferruginous, remainder of abdomen black, appearing purple in certain lights; second tergite with small close distinct punctures. | <i>decora</i> (Smith). |
| Thorax not narrower posteriorly than anteriorly; second tergite with a distinct median longitudinal groove anteriorly and with large, dense, deep punctures; abdomen entirely black | <i>petina</i> , sp. n. |

Smicromyrme lochia, sp. n.

♀.—Head and abdomen black; thorax entirely ferruginous; coxæ, trochanters, and femora ferruginous like the thorax, the tibiæ and tarsi dark ferruginous, somewhat blackish; second tergite with an elongate anterior median spot and a narrow band at the posterior margin of dense appressed pale pubescence; third tergite with a broad band of dense appressed pale pubescence; scutellar scale entirely absent; pygidial area defined laterally by a carina, obscurely finely longitudinally rugose on anterior half, otherwise glabrous. Length 6 mm.

Head black, the mandibles except the tips, antennal tubercles, scape, and pedicel all ferruginous; clypeus and genæ clothed with appressed pale pubescence; front and vertex with sparse erect black pubescence; antennal scrobes carinate above; front, vertex, and genæ with moderate dense confluent punctures; relative widths of head and thorax, 2.6–2.2.

Thorax entirely ferruginous, the dorsum clothed with sparse, erect, dark ferruginous pubescence, the posterior

face of propodeum with sparse long erect pale fuscous pubescence, and the pleural areas with very sparse pale pubescence; mesonotal area not noticeably constricted, the lateral margins of the dorsum crenulate and subparallel; dorsum with dense deep confluent punctures merging into the reticulate dorsum of propodeum, the reticulate area extending on to the anterior part of the posterior face of propodeum; humeral angles angulate but not prominent; scutellar scale entirely absent; pleural areas glabrous, micropunctate.

Abdomen black, except the first sternite ferruginous; abdominal pubescent markings as above; second tergite with a shallow median longitudinal groove anteriorly; anterior pale pubescent spot in the median groove; second tergite with moderate dense punctures except laterally, the punctures separated, and the distal margin glabrous and finely punctate; tergites three to five finely punctate; pygidial area as described above; first sternite with a distinct median longitudinal carina; second sternite with moderate distinct separated punctures; pubescence of all the sternites pale.

Legs ferruginous like the thorax, except the tibiæ and tarsi very dark blackish; calcaria pale.

Holotype.—♀, Mt. Matang, Sarawak, Borneo, December, 1913 (*G. E. Bryant*), in British Museum (Natural History).

Paratype.—♀, Penang, Federated Malay States, October 1913 (*G. E. Bryant*).

Very similar to *parva* Brown, the colour and the pubescent markings being the same, except in *parva* the antennal tubercles are black and the first tergite is tinged with ferruginous. Differs from *parva* in having the lateral margins of the dorsum of the thorax crenulate, in the coarser puncturation, and the anterior median longitudinal groove of the second tergite.

It is doubtful whether or not the locality labels on the holotype and paratype are correct. My opinion is that the locality label of the holotype is probably correct and that of the paratype incorrect. It seems to me unlikely that this species occurs in both localities. Additional lots of material from both localities are necessary before the geographical distribution of the species can be definitely settled.

Smicromyrme basalis basalis (Smith).

2 ♀♀, Mt. Matang, Sarawak, December 1913 and January 1914 (*G. E. Bryant*).

Genus *EPHUTOMORPHA* André.*Ephutomorpha tulagiensis*, sp. n.

♀.—Black, except proximal two-thirds of mandibles, clypeus entirely, proximal half of flagellum beneath, coxæ, trochanters, proximal half of femora, proximal half of tibiæ, and tarsi entirely, all testaceous, and a large elongate subrectangular spot on dorsum of thorax, as well as a small transverse median spot on second tergite both ferruginous; vertex and mesonotum each with a pair of small spots of pale glittering pubescence; distal margin of first tergite and distal margin of second tergite each with a pair of pale spots, the colour integumental and pubescent; fifth tergite with a median spot of pale pubescence; proximal half of pygidium longitudinally striate, the distal half granulate. Length 5.5 mm.

Head black, except the proximal two-thirds of mandibles, clypeus entirely, and proximal half of flagellum beneath testaceous; clothed with sparse fuscous to black pubescence except the vertex, with a pair of spots of pale glittering pubescence contiguous with the eyes, the anterior margin of front with a few pale hairs and the scape pale pubescent; mandibles edentate, without a tooth within, the distal third black; antennal tubercles distinctly separated; first segment of flagellum about one and one-half times longer than the second; antennal scrobes not carinate above; front, vertex, and genæ with small dense more or less confluent punctures; relative widths of head and thorax, 2.5 : 2.3.

Thorax hexagonal in outline, black, except the dorsum with a large elongate subrectangular ferruginous spot, the latter extending from the anterior margin of the mesonotum to the posterior margin of dorsum of propodeum and its anterior margin angulate medially; mesonotum with a pair of obscure spots of pale glittering pubescence situated at the lateral margins of the ferruginous spot; dorsum of propodeum elsewhere with black pubescence and with small dense punctures throughout; scutellar scale absent; posterior face of propodeum with

small distinct separated punctures and clothed with sparse erect pale hairs; propleuræ finely punctured; anterior area of mesopleuræ glabrous, the ventro-dorsal ridge densely punctate and the posterior area glabrous, impunctate; metapleuræ and sides of propodeum glabrous, impunctate.

Abdomen black, except posterior third of second sternite, and third and fourth sternites more or less testaceous, the distal margin of first and second tergites each with a pair of pale spots, the colour both integumental and pubescent, and the second tergite also with a median transverse ferruginous spot; anterior face of first tergite with sparse small punctures, the dorsal face densely punctate; pale spots at distal margin separated by about their own diameter; second tergite with small dense punctures throughout, the pale spots at the distal margin almost as high as broad and separated by about one and one-half times their own transverse diameter; tergites three to five with fine dense punctures, all the tergites clothed with sparse black pubescence except as noted, the lateral margins of each with obscure sparse pale hairs, and the fifth tergite with a median spot of pale pubescence; pygidium as noted above; first sternite with a median longitudinal carina on the anterior half; second sternite with distinct, more or less contiguous, punctures; sternites three to five with small close punctures at the distal margin; last sternite with small close punctures; all the sternites with sparse pale pubescence.

Legs testaceous except the distal half of the femora and distal half of tibiæ black; tibiæ with a single row of spines; calcaria pale testaceous.

Holotype.—♀, Tulagi, British Solomon Islands, December 25, 1934, Sasapi cutting (*H. T. Pagden*), in University of Minnesota collection.

Paratypes.—2 ♀♀, Tulagi, British Solomon Islands, December 25, 1934, Sasapi cutting (*H. T. Pagden*).

Related to *pagdeni* Mickel, but differs in the glabrous impunctate posterior area of mesopleuræ and metapleuræ, the granulate distal half of pygidium, testaceous clypeus, ferruginous spots on dorsum of thorax and second tergite, and smaller pale spots at distal margin of second tergite.

LITERATURE CITED.

- BRYANT, G. E. 1919. "Entomology in Sarawak, Borneo." *Ent. Mo. Mag.* iv. pp. 70-76.
 HARRISON, T. H. 1933. "The Oxford University Expedition to Sarawak 1932." *Geogr. Journ.* lxxxii. pp. 385-410.
 MICKEL, CLARENCE E. 1935. "The Mutillid Wasps of the Islands of the Pacific Ocean (Hymenoptera; Mutillidae)." *Trans. Roy. Ent. Soc. London*, lxxxiii. pp. 177-312.
 RICHARDS, P. W. 1936. "Ecological Observations on the Rain Forest of Mt. Dulit, Sarawak.—Part I." *J. Ecol.* xxiv. pp. 1-37.

XLIII.—*Le prétendu genre Pseudaplodon de Gerrit S. Miller (Aplodontia asiatica Schlosser) du Pontien de Mongolie.* Par le Docteur MADELEINE FRIANT.

GRÂCE à l'amabilité du Professeur Wiman, j'ai pu étudier, pendant l'été 1935, à l'Institut de Paléontologie de l'Université d'Upsal, tous les ossements actuellement connus de l'*Aplodontia asiatica* Schl. du Pontien de

Fig. 1.

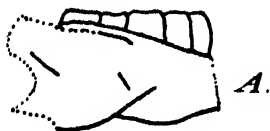


Fig. 2.



Aplodontia asiatica Schl. (Pontien). Mongolie, 1919. Coll. Pal. Fac. Upsal. Fragment d'hémimandibule droite (α) avec les quatre dents jugales en place. G. N., $\times 2$ environ, dessiné à Upsal d'après nature.

Fig. 1, face externe ; fig. 2, face interne.

Mongolie et qui ont été décrits par Schlosser en 1924 *. Les documents les plus importants consistent en un fragment d'hémimandibule droite avec les quatre dents jugales en place (α) (fig. 1 et 2) et un autre fragment, plus petit, d'hémimandibule gauche, avec, seulement, la prémolaire en place (β) (de ce fragment, je n'ai représenté que le face triturante de la prémolaire, fig. 7).

On sait que, mise à part cette forme asiatique fossile décrite par Schlosser, les *Aplodontia* sont des Rongeurs

* Schlosser, M., "Tertiary Vertebrates from Mongolia," 'Palaeontologia sinica,' 1924, p. 30, pls. ii. et iii.

uniquement connus, du Pliocène à l'Actuel, en Amérique du Nord.

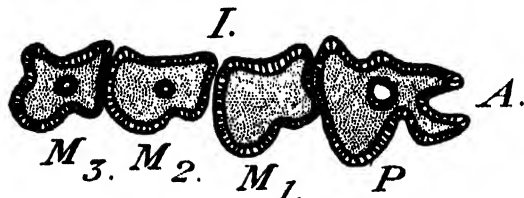
Miller, en 1927 *, a cru devoir, d'après le seul examen des figures de Schlosser, faire de l'*Aplodontia asiatica* le type d'un genre spécial, le genre *Pseudaplodon*, se basant tout à la fois sur la dentition et les caractères de la mandibule.

I. Examen de la dentition.

La formule dentaire jugale est, au maxillaire inférieur, chez l'*Aplodontia asiatica*, comme chez les autres *Aplodontia* : $1P+3M$ †. Il s'agit, ici, d'un adulte et, par conséquent, de dents abrasées.

Les molaires sont constituées de deux lobes inégaux, l'antérieur étant le plus petit, séparés par un sinus situé du côté externe (fig. 3). Chez l'*Aplodontia* actuel,

Fig. 3.



Aplodontia asiatica Schl. (Pontien). Mongolie, 1919. Coll. Pal. Fac. Upsal. Série des dents jugales de l'hémimandibule droite (α). G. N., × 5 environ. A, coté antérieur; I, coté interne.

lorsque ces dents sont abrasées, l'aspect est le même, mais, du côté interne, la séparation des deux lobes est marquée par une saillie en forme d'éperon (fig. 4) qui n'existe pas chez la forme fossile et qui est située, non pas exactement au milieu de la dent, mais un peu en avant de ce milieu, correspondant sensiblement au sinus qui existe du côté externe. Miller ‡ nomme cette saillie mésostyle, l'assimilant ainsi à la partie que l'on désigne quelquefois sous ce nom aux molaires supérieures du

* Miller, G. S., "Revised Determinations of some Tertiary Mammals from Mongolia," "Paleontologia sinica," 1927, p. 13.

† C'est, d'ailleurs, la formule jugale inférieure de la plupart des Rongeurs. On sait que les *Aplodontia* ont, au maxillaire supérieur : $2P+2M$.

‡ Miller, G. S., loc. cit. p. 13.

Cheval *. Il faut noter que le nom de mésostyle est donné, dans la nomenclature trituberculaire, à un tubercule situé entre le parastyle et le métastyle, à la marge externe de la couronne des dents jugales supérieures, chez certains Insectivores de type carnassier (fig. 5). Je le considère, ainsi que le parastyle et le métastyle, comme une formation d'origine cingulaire. Ce que l'on appelle mésostyle dans la molaire supérieure des Equidés n'a

Fig. 4.

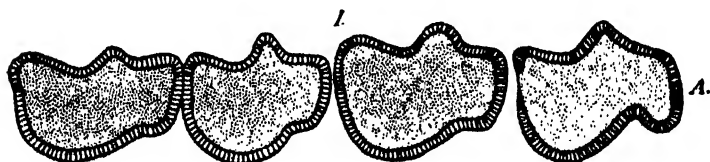


Fig. 5.

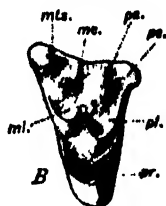


Fig. 6.

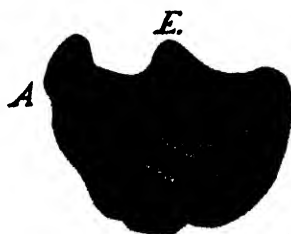


Fig. 4.—*Aplodontia* sp. (actuel). Washington, Jacoma. Coll. British Museum, 93.11.3.4. Série des dents jugales supérieures droites. G. N., $\times 5$ environ.

Fig. 5.—*Potamogale* (insectivore actuel). Schéma de la 2^e molaire supérieure (M^2) droite; me., mésostyle. (D'après Allman, extrait d'Osborn-Gregory.) G. N., $\times 3.5$ environ.

Fig. 6.—*Hipparion* sp. (Pontien). Chine, Province Shansi, Pao te Hsien. Coll. Pal. Fac. Upsal. Molaire supérieure gauche, non abrassée; le mésostyle est le point de réunion des deux tubercles externes qui se trouve, ici, sous la lettre E. G. N.

aucun rapport avec ce mésostyle des Insectivores carnassiers; ce n'est même pas un tubercule, c'est le point de réunion des deux tubercles externes devenus séléodontes (fig. 6) et qui fait saillie sur les dents usées. Le prétendu mésostyle des dents jugales inférieures des *Aplodontia* actuels est peut-être comparable, quant à

* Rappelons qu'il s'agit, ici, de molaires inférieures et que, chez le Cheval, il n'existe, aux molaires inférieures, aucune saillie comparable.

sa signification, à la formation appelée mésostyle dans les dents jugales supérieures du Cheval mais ne saurait lui être assimilée puisque, dans un cas, il s'agit de dents inférieures et, dans l'autre, de dents supérieures. Ni l'un ni l'autre ne sont de véritables mésostyles dans le sens que l'on a donné primitivement à ce terme. Miller attache une telle importance à cette saillie que, d'après lui, son inexistence chez la forme fossile suffit à justifier sa création d'un genre nouveau.

Il faut noter, cependant, que le prétendu mésostyle est très net sur la prémolaire, P_4 , aussi bien chez l'*Aplodontia asiatica* de Schlosser que chez l'*Aplodontia* actuel, et ceci, non seulement sur l'hémimandibule bien conservée de la collection d'Upsal (α) (fig. 3) mais aussi sur l'autre fragment, avec P_4 encore en place (β) (fig. 7).

Fig. 7.



Fig. 8.



Fig. 7.—*Aplodontia asiatica* Schl. (Pontien). Mongolie, 1919. Coll. Pal. Fac. Upsal. Prémolaire en place sur le fragment mandibulaire gauche (β). La figure a été retournée et se trouve droite, ici, pour pouvoir être comparée plus facilement à la prémolaire de l'*Aplodontia* actuel (fig. 8). G. N., $\times 5$ environ.

Fig. 8.—*Aplodontia major* Merriam (actuel). Californie, Liskujon bo. Coll. British Museum, 5.1.7.32. Prémolaire inférieure (P_4) droite intraalvéolaire (non abrasée). G. N., $\times 5$ environ.

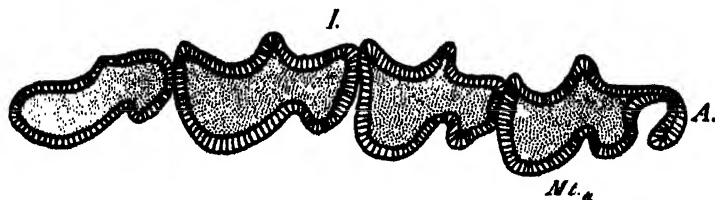
Ayant pu nous procurer, au British Muséum, grâce à l'amabilité de M. A. C. Hinton, une prémolaire vierge d'*Aplodontia* actuel, nous avons pu interpréter cette saillie et en déterminer la signification. La couronne vierge de la prémolaire de l'*Aplodontia major* Merriam, actuel, est formée d'une crête externe, semi-circulaire, avec concavité dirigée du côté interne, s'unissant à une autre crête interne de même aspect, mais d'une courbure plus étendue. Deux crêtes transversales, séparées par une peu profonde dépression médiane (tube très court), relient les deux premières crêtes, laissant de chaque côté deux tubes intermédiaires plus allongés, l'un antérieur et l'autre postérieur (fig. 8). Du point de réunion antérieur des deux

crêtes longitudinales, partent deux autres crêtes obliques d'arrière en avant et de dedans en dehors. Ces deux crêtes constituent le lobe antérieur de la dent, et les deux crêtes longitudinales incurvées avec leurs annexes, son lobe postérieur.

On comprend de suite que le prétendu mésostyle résulte de l'abrasement du point de réunion de ces diverses crêtes.

Chez l'*Aplodontia* actuel, lorsque la prémolaire est vierge ou peu abrasée, son lobe antérieur est plus allongé que dans les molaires, mais lorsqu'elle est très abrasée, ce lobe antérieur est, comme dans les molaires, plus court que le postérieur. Il est à supposer qu'à l'état vierge toutes les dents jugales possédaient sensiblement le même aspect que la prémolaire.

Fig. 9.



Aplodontia major Merriam (actuel). Californie, Liskujon bo. Coll. British Museum, 5.1.7.32. Série des dents jugales inférieures droites. Il s'agit d'un animal encore jeune et la molaire temporaire, *Mt.*₄, est encore en place ; la prémolaire sous-jacente, représentée fig. 8, est déjà calcifiée. G. N., $\times 5$ environ.

Chez l'exemplaire fossile que nous avons examiné, si le prétendu mésostyle, bien visible sur la prémolaire encore jeune, a disparu aux prémolaires usées, c'est, probablement, qu'à partir d'un certain niveau, assez rapproché du sommet, la colonette, dont cet éperon est la coupe, n'existe pas ; les dents jugales sont en effet radiculées chez le fossile, c'est à dire qu'elles présentent, à un moindre degré que la forme actuelle, le caractère de dents à croissance continue.

Sur la face triturante des dents jugales les moins abrasées (*P.*₄, *M.*₂, *M.*₃), il existe, chez l'*Aplodontia asiatica*, un tube intermédiaire ; dans les spécimens actuels que j'ai sous les yeux je n'en observe pas, mais chez des sujets

assez jeunes, il en existe certainement, comme permet d'en juger la prémolaire non abrasée décrite plus haut et qui possède trois tubes intermédiaires, dont celui du milieu à peine indiqué. Ces trois tubes sont également visibles sur la prémolaire fossile du fragment β (fig. 7). Un seul d'entre eux, l'antérieur, plus profond que les autres, subsiste au niveau de la prémolaire et des deux dernières molaires de la mandibule α (fig. 3).

En somme, l'*Aplodontia asiatica* avait des dents jugales radiculées qui possédaient au moins un tube intermédiaire bien développé. Chez la forme actuelle, par contre, molaires et prémolaires sont à croissance nettement continue et leur tube intermédiaire principal (l'antérieur) est certainement beaucoup plus court, puisque, à un stade

Fig. 10.

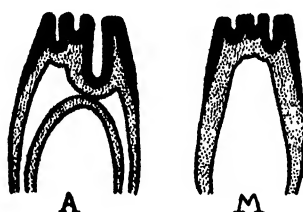


Schéma de la coupe verticale de deux prémolaires d'*Aplodontia*.

A. *Aplodontia asiatica* Schl.; Miocène supérieur. M. *Aplodontia major* Merriam (actuel). G. N., $\times 5$ environ.

d'usure moins avancé (fig. 9) que celui des dents de la mandibule fossile, et où la molaire temporaire est encore en place, il n'y a déjà plus trace de tube intermédiaire au niveau des molaires définitives.

Il est donc à noter que, chez les Aplodontidés comme chez les Théridomyidés, les formes anciennes (*Aplodontia asiatica* Schl., du Miocène supérieur) avaient des dents jugales à croissance relativement limitée, à racines nettes, à tubes intermédiaires bien développés et profonds, tandis que chez les formes plus récentes (*Aplodontia major* Merriam, actuel) ces dents sont à croissance nettement continue et à tubes intermédiaires plus courts (fig. 10).

II. Examen de la mandibule.

Quant à la mandibule elle-même, très fragmentaire, elle paraît se rapprocher beaucoup de celle de l'*Aplodontia* actuel. J'ai constaté sur l'exemplaire α que la branche montante est brisée comme l'indique le pointillé de la fig. 1. Miller avait cru, n'ayant à sa disposition que les photographies de Schlosser, qu'il s'agissait du véritable contour supérieur de la mandibule, c'est pourquoi il compare l'*Aplodontia asiatica* à l'*Alactaga* et au *Ctenodactylus* qui ont tous deux une branche montante très

Fig. 11.



Hémimandibule droite, face externe.

En haut : *Aplodontia major* Merriam (actuel). Californie, Lisakujon bn. Coll. British Museum, 5.1.7.32.

En bas : *Ctenodactylus gundi* Pall. (actuel). No. 1925-193. Coll. Anatomie comparée, Muséum, Paris.

basse : c'est certainement une erreur d'interprétation. Au surplus, la dentition de l'*Alactaga* et celle du *Ctenodactylus* diffèrent totalement de celle de l'*Aplodontia*.

Sur le fragment de mandibule fossile que j'ai examiné, la partie correspondant au processus angulaire est complètement brisée, je ne puis donc la comparer à ce qui existe sur la forme actuelle.

Il résulte de notre exposé qu'il convient de maintenir l'*Aplodontia asiatica* dans le genre *Aplodontia*. Si Miller est parvenu à une autre conclusion, c'est, en grande partie, parce que ses observations n'ont porté que sur les photographies de Schlosser.

XLIV.—The Echinoid Name *Diadema*.

By TH. MORTENSEN.

IN "A Vote on some Echinoderm Names" (Ann. & Mag. Nat. Hist. ser. 10, vol. x. 1932, pp. 360–365) I gave a full account of the history of this name, *Diadema*, from its first appearance in literature in 1711 until 1912, when after having been in constant and unanimous use in the whole echinological literature, zoological and palæontological, it was rejected by Jackson as being a synonym of the Cirripedian *Coronula* Schumacher (1817), and substituted by the name *Centrechinus*. With the exception of Jackson, H. L. Clark, Deichmann, Fisher, and Hawkins, all Echinologists sided with me in recommending that the name *Diadema* should be made a nomen conservandum for the Echinoids, with genotype *Echinometra setosa* Leske, the species that has always been regarded as such.

When at the International Zoological Congress in Lisbon, 1935, I brought the case of the name *Diadema* before the Commission on Nomenclature Captain Fr. Hemming advised to have it adjourned until the use of this name in the 'Museum Calonnianum,' 1797, had been made the object of a careful investigation. During a visit to London in July this summer (1936) I had the opportunity of undertaking such investigation, the result of which I beg to publish here.

In the said "Vote on some Echinoderm Names" I stated (p. 361) as follows:—"In the anonymous 'Museum Calonnianum,' 1797 (p. 64), the name *Diadema* is used as a genus-name for Echinoids, but it is not possible to see which species should be regarded as the type of this genus." It was on the authority of Jackson ('Phylogeny of the Echini,' p. 27) * that I gave this statement (I had at that time never seen the 'Museum Calonnianum'), but the statement is not correct, as the following analysis will show.

* Jackson says here: "There are 12 species listed under *Diadema*, but of these only one is recognizable, as it is stated to be the same as *Echinus esculentus* Linné. On this evidence, if this work should be accepted, which is very doubtful, the genus *Diadema* would become a synonym of *Echinus*, as *esculentus* is the type of that genus." The fact that several of the species, not only the first one, are recognizable does away with this argument for regarding *Diadema* as a synonym of *Echinus*.

The 'Museum Calonnianum' (whose author has been shown to be the London naturalist-dealer G. Humphreys) has under the "Class II. Echinus. Oursin de Mer—Sea Urchin" the following five genera: *Placenta*, *Scutum*, *Cor*, *Diadema*, and *Cidaris*. Although it is quite possible to identify several of the species enumerated under these genera, there is no reason for entering on a discussion of all of them. It is only the genus *Diadema* that has any interest and needs a detailed discussion.

Under the genus *Diadema* Turban, the following species are enumerated:—

1183. *vulgatum*. (a) with the spines on. L'Ordinaire—Common. Normandy.

This no doubt must be the common N. Atlantic species *Psammechinus miliaris* (Müll.).

1184. *orbiculatum*. L'Orbiculaire—Orbicular. Normandy.
Echinus esculentus Linn.

This is clear enough. It is curious that Humphreys gives new names to several species which he identifies with Linnean species—e. g., *Echinus orbicularis*, *Echinus rosaceus*.

1185. *depressum*. Le Plat—Flatted. West Indies.

This species cannot be identified.

- 1186 (misprint 1116). *virescens*. Les Epines Vertes—Green-spined. Newfoundland. Has the spines on.

This can clearly only be *Strongylocentrotus dræbachiensis* (O. Fr. Müller).

1187. *aciculatum*. Les Epines Pourpres—(dark) Purple, (long) Needle-spined. Mediterranean. Has the spine on. (The words "dark" and "long" are handwritten additions in the copy of the British Museum.)

This can clearly only be *Paracentrotus lividus* (Lamarck).

1188. *ovatum*. (a) Native colour, with the teeth and some of the spines; (b) bleached; (c) opened to shew the internal structure. L'Oeuf—Egg. West Indies.

This may probably be *Tripneustes esculentus* (Leske).

1189. *rotundum*. Le Circulaire—Circular. East Indies. Unidentifiable.

1190. *limatum*. Les Epines en forme de Lime—Blunt file-like, spined. West Indies.

This can very well be *Diadema antillarum* Philippi (Archiv f. Naturgesch. 1845, i. p. 355), as shown by the description of the spines.

1191. *subulatum*. Les Epines en forme d'Alêne—Awl-like, spined. West Indies.

This may perhaps be *Lytechinus variegatus* (Lamarck).

1192. *maculatum*. Les Epines Tachetées—Spotted red-spined. Mediterranean. Rare.

This must evidently be *Sphærechinus granularis* (Lamarck).

1193. *striatum*. Les Epines Longues Striées—Long striated spined. Mediterranean. Rare. This has several of *Serpula lumbricalis*, species 15, entwined round its spines.

This must be one of the Mediterranean Cidarids, either *Cidaris cidaris* (Linn.) or *Stylocidaris affinis* (Philippi).

1194. *sceptiferum*. Les Epines au Sceptre Couronné—Coronated sceptre-spined. Tranquebar. M.P. 3051. Extremely scarce.

M.P. is "Museum Portlandianum," 3051: "The coronated sceptre-spined *Echinus*, extremely scarce, from the E. Indies, *Favanne*, p. 80, fig. L, the only specimen of its kind in England."

De Favanne. Conchyliologie, 1780, pl. lxxx. fig. L, is evidently *Plococidaris verticillata* (Lamarck).

Thus, among the identifiable species under Humphreys' *Diadema* is one species, *limatum*, which may very well be the species always understood as *Diadema*, the *Diadema antillarum* Philippi, and since all the other identifiable species belong to long-established genera, Humphreys' *Diadema limatum* would be the only suitable species to select as the genotype of *Diadema*.

The Echinoid genus name *Diadema* thus originates from Humphreys, 1797, not from Gray, 1825 ("An Attempt to divide the Echinida, or Sea Eggs, into Natural Families," 'Annals of Philosophy,' xxvi.), as is usually stated, and very probably Gray did not mean to establish *Diadema* as a new genus of Echinoids. It can hardly be doubted that he knew the 'Museum Calonnianum,' and that he took the name from there. In general, he adds the name of the author to his genera, and at the genera *Echinanthus* and *Echinolampas* he adds "nob.," thus directly indicating that here are new genera established by him. That he does not add any author's name to *Diadema* is quite natural, since 'Museum Calonnianum,' from where he probably took it, is anonymous. Unfortunately this argument is not conclusive, since he does not add any "nob." either at *Astropyga*, which—so far as known—has not been used before 1825. But in any case, *Gray is not the first to use the name Diadema for an Echinoid. The name dates from 1797 and thus has the absolute priority in the use for the Echinoids—even if we do not count Schynvoet's name from 1711 or Lamarck's use of the not latinized form "les Diadèmes" in 1816—and the name accordingly was preoccupied already when Schumacher in 1817 and Ranzani in 1820 used it for the Cirriped an Lepas diadema Linnæus, for which Oken had, in 1815, established the genus Coronula. Schumacher's and Ranzani's Diadema is, of course, only a dead synonym of Coronula Oken*, but the Echinoid name Diadema Humphreys remains unaffected thereby.*

Thus far there would seem to be no doubt of the validity of the name *Diadema* as an Echinoid genus name. But, again, there is a complication.

The International Commission on Zoological Nomenclature has had a discussion about the 'Museum Calonnianum,' resulting in the "Opinion" 51, which says: "The Museum Calonnianum, 1797, is not to be accepted as basis for any nomenclatorial work." The object of this "Opinion" was, of course, to prevent undesirable

* The eminent authority on Cirripedians, Dr. Hj. Broch, Oslo, writes me that even if Schumacher's *Diadema* had priority before the name *Coronula*, the latter is so generally known that it could only bring confusion to change it. "I think it out of question that the name *Diadema* could, on the whole, be taken into consideration as a genus name of a Cirripedian. It is a 'dead synonym' of *Coronula*."

nomenclatorial changes based on this very little known work. If the commissioners had known the case of the name *Diadema*, in which the 'Museum Calonnianum' serves to prevent the extremely undesirable change of that name, they would hardly have given the "Opinion" 51 the quoted wording, the more so since the "Opinion" 51 was not accepted unanimously by the commissioners. But this wording necessitates a separate acting in this case for declaring the Echinoid name *Diadema* a nomen conservandum.

A few words must be said about the question: which species of sea-urchin is to be the genotype of *Diadema*? If it were not already fixed, Humphreys' species *limatulum* would have to be selected as the genotype, since it may be identical with the species now unanimously named *Diadema antillarum* Philippi. But Gray, *op. cit.*, already fixed the species "*Echinometra setosa*" of Leske as the genotype. In doing so he actually was in conformity with the opinion of the present author that the only species in the 'Museum Calonnianum' that could be made the genotype of *Diadema* is *limatulum* possibly = *Diadema antillarum* Philippi, this latter being at that time (as a matter of fact up till 1904) regarded as identical with the Indo-Malayan "*Echinometra setosa*" of Leske, the name *limatulum* thus being apparently synonymous with the older name *setosum*.

Having regard to the foregoing considerations, to the universal use of the name *Diadema* for the Echinoids since Gray's time (up till 1912), and to the very unfortunate consequences (*cf.* "Vote on some Echinoderm names," *Ann. & Mag. Nat. Hist.* 10, ser. x. 1932, pp. 360-362) of dropping this name—not because any other animal has a legitimate claim to it, but—formerly—because it was erroneously thought to be merely a dead synonym of the Cirripedian *Coronula*, now, because "Opinion" 51 forbids the use of a name from the 'Museum Calonnianum'—I recommend that the International Commission on Zoological Nomenclature, acting in virtue of the plenary powers conferred upon them by the International Zoological Congress, should issue an Opinion in the following sense:

Nothing in Opinion 51 shall be held to invalidate the use of the generic name *Diadema* Humphreys (1797,

Mus. Calonn. p. 64) in Echinoids (genotype, as fixed by Gray 1825, *Echinometra setosa* Leske, 1778), and that generic name is hereby added to the Official List of Generic Names.

P.S.—The manuscript of this note I submitted to Professor H. L. Clark asking for his opinion about it. He informs me that in his opinion the description of the spines of *Diadema limatulum* rather suggests the West Indian Cidarid *Eucidaris tribuloides* (Lamarck) than *Diadema antillarum*. It had not occurred to me that the "file-like" spines could fit in with any other West Indian Echinoid than *Diadema antillarum*; but I have to agree that the spines of this Cidarid may, if well preserved, very well be described as "file-like," and, if special weight is given to the word "blunt," it is more likely that the *Diadema limatulum* of Humphreys was *Eucidaris tribuloides*, the spines of *Diadema antillarum*, if well preserved, being certainly not to be described as "blunt." But if the spines are broken, as they would be sure to be in such an old specimen (these spines are exceedingly brittle and can only be kept tolerably intact on specimens treated very carefully, which, of course, they never were in olden days), they may very well be designated as blunt—as are actually the spines of the oral side, even when intact—and they are very decidedly and conspicuously *file-like*.

Accordingly the *Diadema limatulum* of Humphreys may have been either *Eucidaris tribuloides* or *Diadema antillarum*.

Anyhow, it is unquestionable that the name *Diadema* was first used as a genus of Echinoids, including several recognizable species, one of which may very well be identical with *Diadema antillarum* Philippi, closely related with the species that Gray selected as the genotype *Diadema*. And since this name has been in unanimous use in the whole of the zoological and palæontological literature from 1825 till 1912, and particularly in that literature which must for ever remain the basis of echinological science—and has been used also in 1925 in a main work like H. L. Clark's 'Catalogue of the Recent Sea-urchins of the British Museum,' and will be used also in the forthcoming vol. iii. of my Monograph of the

Echinoidea—it will be impossible ever to get rid of the name *Diadema* in the Echinoids. On the other hand, there is nothing to speak in favour of the name *Centrechinus*, used only after 1912, and not in a single work of primary importance; it will rapidly share the fate of the immense number of other useless synonyms. I may well recall also the numerous (more than 25) valid names of recent and fossil Echinoids composed of *Diadema* (cf. "Vote on some Echinoderm names," p. 362), and the general use of the technical term "diadematoïd." I can only find it an absurdity to drop the name *Diadema* and must emphatically recommend to have it placed on the official list of generic names as a *nomen conservandum*.

XLV.—*A new Species of Plesiothrips (Thysanoptera—Thripidae) from Argentina.* By G. D. MORISON, North of Scotland College of Agriculture, Aberdeen, Scotland.

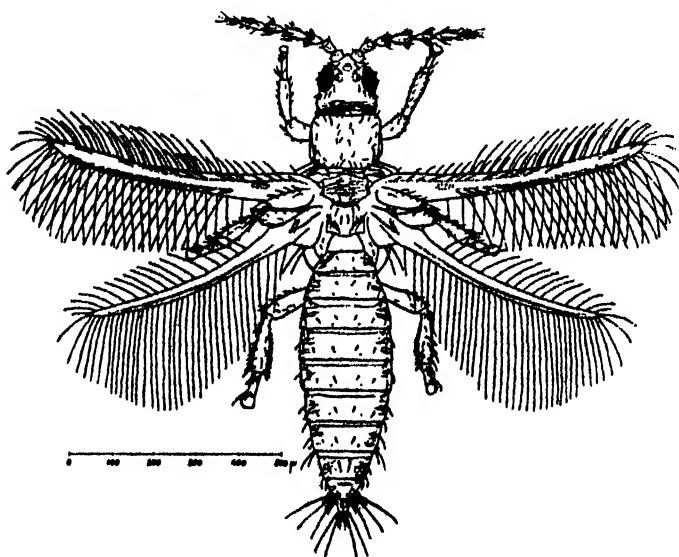
I AM indebted to Mr. F. Laing, of the British Museum (Natural History), for submitting to me for classification three adult female Thripids from Argentina. The insects belong to a new species which is named in honour of Mr. G. L. Fawcett, who obtained them inside sheaths of rice (Agr. Expt. Station, Tucuman, Argentina, 4. ix. 1935). The holotype and one paratype are deposited in the Collection of the British Museum.

Plesiothrips fawcetti, sp. n.

Holotype ♀ (macropterous) (see figure): General body-colour fairly dark brown, with the antennæ and head concolorous darker brown and abdominal segment vii. and the sides of the apical abdominal segments slightly darker than the basal segments. The colour lies in the cuticle, and some red colour lies below it in the prothorax and pterothorax. Antennæ uniformly dark brown except for a little paler yellowish-brown shade across the base of segment i. and in the apical third of ii. and in the pedicel of iii. Ocellar crescents reddish brown. Mouth-cone and ends of tarsi tipped with dark brown. Maxillary and labial palpi very pale brown. Legs same colour

as body, except that all tarsi are paler yellowish brown, and this colour shades the apices of the tibia and the extreme bases of the femora. Fore wing brown with slightly darker longitudinal veins and a small, elliptical, clear area in the middle just before the base of the second long vein.

Hind wing pale brown with a dark longitudinal vein. Ovipositor very pale brown. Bristles same colour as the cuticle, to which they are attached, except on the two long veins of the fore wings, where they are slightly darker.



Plesiothrips fawcetti, sp. n. ♀.

Measurements in μ .—Length (width): antennal segments i. 26 (32), ii. 29 (26), iii. including pedicel 38 (21), iv. 52 (20), v. 40 (18), vi. 60 (20), vii. 27 (9); total length of antenna (distended) 290; head, length from fore margin of eyes to base 114 (137 greatest width behind eyes); prolongation of head in front of eyes 24 (78); ocelli about 13 (13); eye 65 (42); mouth-cone 120 (132 at base); maxillary palp segments i. 12 (8), ii. 10 (6), iii. 13 (3); labial palp segments i. 3 (6), ii. 10 (3);

pronotum 133 (165-140); mesothorax 87 (216); metathorax 102 (210); fore wing 648 (42 at middle); abdomen, total length of sclerites 636 normal length about 500 (220); ovipositor 145; total length of distended insect 1440 Length of bristles, interocellar 40, post-ocular 24-15; on posterior angles of pronotum, each 58; on abdominal tergites ii. 9-35, iv. 9-45, viii. 26-38, ix. 120-145, x. 130; length of teeth of comb on viii. 3.

Head somewhat produced in front of eyes; cheeks weakly curved; posterior third of occiput weakly transversely striate. Eyes black, projecting only slightly, occupying about half the length of the head, and separated from one another by about the length of an eye. The inner angle of the eye is rounded and the facets are moderate in size, and about three hairs are seen in optical section of the eye. Ocellar lenses about equal in size. Anterior ocellus lying in front of the fore margin of the eyes; the posterior pair of ocelli opposite the middle of the eyes, and separated from them by the diameter of a lens of the eye. The interocellar bristles lie between the anterior and the lateral ocelli. A row of five post-ocular bristles lie on each side of the head. Mouth-cone broadly rounded.

Antennæ 7-segmented, inserted in front below the vertex of the head and closely approximated. Segment i. almost rectangular, broader than long, ii. barrel-shaped, but more constricted at the base, iii. with a short pedicel, iv. fusiform, narrower at the base than at the apex, v. shaped like ii. but much narrower, and constricted into a short annulus at the base, vi. elongate-ovoid, constricted into a short annulus at the base, and with sides tapering into vii., which ends with a fairly blunt apex. A forked, curved trichome is present on the dorsal surface of iii. just posterior to the apex, and another is placed similarly on the ventral surface of iv. All the segments bear a few hairs, and besides these v. and vi. bear respectively two simple sense-cones.

Pronotum with angles rounded and sides converging slightly to posterior. A pair of equally long bristles at each posterior angle and 36 hairs placed on the surface as depicted. Meso- and metathorax of normal structure. Legs normal, bearing many short hairs; hind tibia with a row of stiff bristles along its inner ventral margin.

Fore wing: costa with 22-23 bristles in addition to the fringe-hairs, which number 17; 1st vein with 4+3 bristles in basal third of its length and 4-5 in the middle third, and 3 widely spaced in the apical third; 2nd vein with 14-15 bristles. Abdomen elongate-ovoid, rather narrow; the posterior margin of tergite viii. bears a comb of six very slender teeth on either side of the middle, ix. and x. bear the usual strong bristles, and x. is split dorsally for the whole of its length. The tergites are marked with a few weak, transverse striæ at the sides. The striæ are stronger across the pleurites and sternites, on which they anastomose. Each of the lower pleurites of abdominal segments iii.-vii. ends in a comb with very weak teeth. The sternites iii.-vii. bears each a row of six hairs near its posterior margin.

Variation in ♀♀.—The two paratypes differ from the holotype as follows:—Antennal segment iii. 35 (21-23), iv. 46 (21-23), v. 35-38 (18); prothoracic bristles, length 58-67; fore wing, length 600-672; bristles on 1st vein number 4-7 in middle third and 2-3 in apical third.

P. fauvelti is characterized chiefly by its uniform dark colour. It resembles closely *octarthrus* Hood and *amblycauda* Hood, both found in Trinidad. It is separated from *octarthrus* by the coloration of its legs and its 7-segmented antenna, though it is probable that the 8-segmented antenna is not constant in a long series of *octarthrus*. It is separated from *amblycauda* by the colour of the legs, the shape of antennal segment iii., the better developed ovipositor, and the divided xth abdominal segment. It is easily separated from *perplexus* (Beach), *andropogoni* Watts, and *andropogoni* var. *watsoni* Watts by its coloration. *P. perplexus* is widely distributed in the U.S.A.; *andropogoni* is recorded from South Carolina and *watsoni* from Florida.

In *Plesiothrips* the male is known only from the specimens of *perplexus* described by Hood. No immature stages have been described. The different species seem adapted for dwelling in the axils of leaves of Gramineæ, on which they have usually been found. It has been suggested that the vestigial or very weak ovipositor is an adaptation to the habitat, and that the eggs may not be laid inside the tissue of the host-plant as is usual in the Thripidæ.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 113. MAY 1937.

XLVI.—*On the Biology and Ecology of Hemiodæcus veitchi*
Hacker (Hemiptera, Peloridiidæ). By I. W. HELMSING
and W. E. CHINA.

[Plates XII.—XVI.]

SINCE the family Peloridiidæ probably comprise the rarest and most remarkable of all the Hemiptera, it is very appropriate to preface this paper by a *résumé* of the history of the group, so that the student may realise the importance and great interest attached to the following account of their habits.

HISTORICAL.

The first specimen to be collected was a macropterous male found by Dr. W. Michaelsen on the 19th December, 1892, in the forest at Puerto Toro, Navarin Island, Tierra del Fuego, during the Hamburg Museum expedition to the Magellan Straits. It was described in 1897 by the German hemipterist Gustav Breddin under the name *Peloridium hammoniorum*. Breddin was naturally at a loss as to the systematic position of this remarkable new genus, and sent the specimen to his French colleague Dr. Maurice Noualhier, who considered that *Peloridium* was related to the Ochteridæ (Pelogonidæ of that time), a family of predatory littoral bugs. Breddin, however, rightly established a new family for it, although agreeing that the Ochteridæ were its nearest relations.

Ann. & Mag. N. Hist. Ser. 10. Vol. xix. 31

Two years later the Swedish hemipterist Dr. C. J. Emil Haglund, unaware of Breddin's paper, redescribed and figured a sub-brachypterous female of the same species under the name *Nordenskjöldiella insignis*. Haglund's specimen had been collected in 1896 under a decaying tree-trunk in the forest around Punta Arenas, on the northern shore of the Magellan Straits, by Dr. O. Norden-skjöld, leader of the Swedish expedition to the Magellan territories. Haglund regarded his new genus as an aberrant member of the Ochteridæ. The same year (1899) Dr. G. Horvath, of the Hungarian National Museum, pointed out that Haglund's new genus and species was merely the female of Breddin's *Peloridium hammoniorum*, and expressed the opinion that Haglund was right in placing his genus in the Pelogonidæ. Kirkaldy, in his list of pagiopodous Heteroptera (1906), placed the genus *Peloridium* in the Ochteridæ, disregarding entirely Breddin's new family. Reuter, in his magnificent survey of the phylogeny and systematics of the Heteroptera (1910), retained the family Peloridiidæ, but placed it, together with the Ochteridæ and Nerthridæ (another family of predatory littoral bugs), in the superfamily Ochteroideæ. He expressed, however, some doubt as to its affinities, and suggested that the head was of a primitive (rather than a specialized) type, from which the head in the Ochteridæ and allied forms had been gradually derived. Nothing more was written on the subject, and for many years these two specimens remained the only known examples of this remarkable family.

Then, in November 1920, Mr. H. Hamilton was sifting leaf-mould which he had gathered in the forest near the railway station of Ohakune, 2,100 ft. up in the N. Island of New Zealand, for Coleoptera, when he discovered a single adult and one nymph of a very curious hemipteron. Later the adult was sent by Mr. J. G. Myers to the celebrated Finnish hemipterist Dr. E. Bergroth, who was astonished to find that it represented a new genus and species of the remarkable Patagonian family recorded many years before. He described it in 1924 under the name *Xenophyes cascus*, and in the same paper recorded the nymph of an unknown species of Peloridiid from Lord Howe Island (halfway between New Zealand and Australia), which had been collected

by Mr. A. M. Lee of Adelaide. Bergroth did not discuss the relationships of the family, although he stressed the singular structure of the head. In the previous year Mr. Frederick Muir, the well-known homopterist of the Hawaiian Sugar Planters' Station at Honolulu, to whom the New Zealand nymph had been sent, had written a short paper on the characters separating Heteroptera from Homoptera, in which he proposed to place the Peloridiidæ either in the Homoptera or in a new suborder of Hemiptera. He considered that the absence of the gula in the family was sufficient to remove it from the Heteroptera. Myers, together with Hamilton and Mr. T. R. Harris, who resided in the Ohakune locality, made vigorous attempts to obtain more material in and around the original locality, but without success. Stimulated by the re-discovery of the family in New Zealand, a search was immediately made amongst the unworked material from Australasia in the British Museum collections. Sure enough, two specimens belonging to the Peloridiidæ were found. These had been collected by Mr. A. M. Lea at Hobart, in Tasmania, in 1904. They were described and figured by the junior author (1924) under the name *Hemiodæcus leai*, and the relationships of the family were discussed.

The homopterous characters were stressed, and, following Muir's suggestion, it was proposed that the family should form a distinct suborder to be called Pseudohomoptera. It was suggested that the nymph from Lord Howe Island recorded by Bergroth belonged to this new genus *Hemiodæcus*. In 1926 Mr. J. G. Myers published an account of the discovery of *Xenophyes cascus* Bergr. in New Zealand, and gave a description and figures of the nymph which Muir had seen. He also gave an interesting description of the type of forest in which the bug was found. The dominant tree was *Weinmannia racemosa* L., and the lower tier of vegetation consisted almost solely of the fern *Blechnum discolor* (Forst f.). Between the *Blechnum* plants the surface of the very deep layer of leaf-mould was bare. A thick deposit of *Weinmannia* leaves apparently inhibited the growth of mosses and liverworts. The bugs were found in this barren leaf-mould.

During an expedition to Patagonia and Chile in the

season 1926-1927, Mr. F. W. Edwards of the British Museum made a special endeavour to obtain specimens of *Peloridium hammoniorum*, but without success. Strangely enough, however, in the same year another specimen of this species was discovered amongst the unworked material of the British Museum. This was a sub-brachypterous male collected by J. Koslowsky in the Valle del Lago Blanco, Territory of Chubut, Argentine Patagonia, in 1910. It was described and figured by the junior author (1927), and at the same time attention was called to the differences between the sub-brachypterous and macropterous forms of the same sex and to certain resemblances to the Pentatomidæ. Koslowsky's record carried the distribution of *Peloridium* much further north, but this was more or less to be expected, since it was known that the ancient antarctic fauna and flora extended along the Andes up to the 40th parallel of latitude.

The family Peloridiidæ now contained three genera, each based on a single species. *Peloridium hammoniorum* Bredd. was represented by three specimens only (all different forms), *Xenophyes cascus* Bergr. was represented by one adult and a nymph, *Hemiodæcus leai* Ch. was represented by two specimens only, and there was also a nymph of an unknown species from Lord Howe Island which was probably a *Hemiodæcus*. These species were all so rare that, at the time, it seemed unlikely that enough specimens to make possible a thorough investigation could ever be obtained. It looked as though the relationships of the family would remain obscure indefinitely. In 1929, therefore, Dr. J. G. Myers and the junior author decided to sacrifice the male specimen of *Hemiodæcus leai*. It was consequently dissected, its morphology described, and the relationships of the family based on the new evidence available were discussed. It was shown that the Peloridiidæ could no longer remain in the Heteroptera. At the same time the peculiar characters did not warrant the establishment of a new suborder—the Pseudohomoptera—suggested by Muir. Consequently it was decided to place the family in the Homoptera, and to erect for it a new series, Coleorrhyncha, equivalent in value to the existing Auchenorrhyncha and Sternorrhyncha.

Three years later a Peloridiid was discovered in Australia,

Mr. H. Hacker of Brisbane, while collecting in the dense rain-forests of the McPherson Range near the southern boundary of Queensland, found three females of what later proved to be a new species of *Hemiodæcus*, in his beating net. They had presumably been beaten from the antarctic beech, *Fagus moorei* F. & M. This species was described by Hacker in 1932, under the name *Hemiodæcus veitchi*, and, as his description was published in the rather obscure 'Queensland Agricultural Journal,' a short paper was published by the junior author in the 'Annals and Magazine of Natural History,' drawing attention to this interesting find. The species was figured side by side with *H. leai*. In this paper it was suggested that the Peloridiidæ might be associated with the Antarctic beeches of the genus *Nothofagus*, especially as the distribution of the family closely followed that of *Nothofagus*. It was presumed that *Peloridium hammoniorum* Bredd. was associated with *Nothofagus antarctica* Forst., *Xenophyes cascus* Bergr. with *N. blairii*, *Hemiodæcus leai* Ch. with *N. cunninghami* Hook, and *Hemiodæcus veitchi* Hack. with *N. moorei* F. & M. Finally, it was pointed out that the occurrence of the Peloridiidæ and *Nothofagus* in Queensland was evidence that the McPherson Range forms a relict "island" of the ancient Antarctic fauna and flora, directly comparable with those of the Arctic fauna and flora found in the Alps and Pyrenees of the northern hemisphere.

It will be readily understood that an investigation into the habitat and biology of this species was much to be desired, and was calculated to throw considerable light on the much-discussed relationships of the group.

In October 1933 the senior author, who had illustrated Hacker's description of *H. veitchi*, was spending his vacation in the McPherson Range studying bird-life. Finding himself in the neighbourhood of the giant Antarctic beeches noted by Hacker, he was tempted to search for *Hemiodæcus*, and was successful in capturing seventeen specimens in twenty minutes. Search in a neighbouring locality resulted in three more specimens. Altogether twenty specimens* were taken, consisting

* Specimens were sent to the British Museum; the F.C.T. Museum, Canberra; Australian Museum, Sydney; Queensland Museum, Brisbane; U.S. National Museum, Washington, and to the Department of Agriculture and Stock, Brisbane.

of males, females, and nymphs. This was the first time that males and nymphs of this species had been found. The discovery of this definite colony of *Hemiodæcus* opened up the possibility of studying the biology of a Peloridiid, and this study was accordingly undertaken by the senior author *.

ECOLOGY.

The Cainbale Range is a branch of the McPherson Range, the former terminating at Mt. Wanungara on the border of Queensland and New South Wales. The McPherson Range starts about three miles from the sea, near Currumbin, and rises gradually along numerous peaks, crests, and ravines, across the heads of Currumbin, Tallebudgera, Nerang Creek, and the Coomera in Queensland and Piccabeen, Coraki, Terranora, and many other creeks flowing into the Tweed River, N.S.W. There are seventeen conspicuous mountains along this range, which runs in a general direction from east to south-west, terminating at Mt. Lindesay. The summits along the border rise to from 3000 to 4000 ft. The whole range is covered with a luxuriant vegetation, among the most remarkable of the trees being the Antarctic beech, *Nothofagus moorei*, order Cupuliferæ.

Although many other spurs and summits on the McPherson Range, including Mt. Hobwee and Mt. Widgee, have now been visited and searched by the senior author, he has failed to find any specimens of *Hemiodæcus veitchi* away from the Cainbale Range, and, even on this range, only within a comparatively small area. The spur terminating on the border at Mt. Hobwee, known as the Hobwee Track, is well studded with Antarctic beech trees but they are small compared with the same species on the Cainbale Range. This can be accounted for by reason of this spur being a razor-back, very narrow and steep, and consequently swept by heavy winds from all quarters, and, during many seasons experiencing long, hot, dry periods. Owing to the quick draining

* Since this was written, Mr. J. W. Evans, Tasmanian Government Entomologist, has described a third species of *Hemiodæcus*, *H. wilsoni*, from a single female collected at Beech Forest, Victoria, by Mr. F. E. Wilson of Melbourne. He has also discovered a fourth species in the National Park, Tasmania, on moss under *Nothofagus cunninghami*.

away of tropical rains, the ground soon becomes dry and hard, and there is, consequently, little or no growth of moss, and the ground under the beeches is covered with fallen leaves, which are dry and crisp, and take a long time to decay.

The Mt. Widgee Track is similar to the Hobwee Track, but on the S.W. slope, which is not so steep, the beeches are much larger, and, in parts, they are as massive as on the Cainbale Range. The same steep razor-back character is present, and it is easy to detect the effect of dry periods and hot dry winds in the quality of the moss and the crisp nature of the dead leaves.

Very different from these two spurs is the Border Track of the Cainbale Range commencing at O'Reilly's Guest House, and from thence winding, rising and falling, for seven miles through the most perfect rain-forest imaginable, and terminating at the border with Mt. Wanungara. Excepting for the last two miles, the razor-back character is absent, and instead we have a broad expanse of undulating heavy bush-land, ending with a gradual rise towards the three-and-a-half mile point, at which site, at a height of some 4000 ft. above sea-level, the first group of the older specimens of the Antarctic beeches are met with, and here also an important moss (*Papillaria kermadecensis* C. Müll.) first makes its appearance. About half a mile further on the track descends easily into what one might describe, for lack of a better term, as a large shallow basin, sheltered from all rough winds by the broad expanse of heavy rain-forest surrounding it, the ground moist and rich, and the growth of moss luxuriant. Even on a very windy day the stillness around one at this point can almost be felt, and reminds one of the peaceful atmosphere in a large cathedral, and only the wind moaning and sighing through the trees on the distant exposed places can be heard. This area is almost continually bathed in mist, the moisture collected by the leaves falling like gentle rain. There is no sign at all that this area has for centuries suffered from any period of dessication. This is the home of *Hemidactylus veitchi* (Pl. XII. fig. A). Here Hacker discovered the first three females of this species, and here the senior author has since secured sixty-two (62) specimens comprising adult males and females and four

stages of nymphs. This site is known as the "Lightning Falls Turnoff" (Pl. XIII. fig. B), a track branching off the main track to the right, leading to the falls of that name. This area has been visited three times by the senior author—September/October 1933 (Australian spring), September/October 1934, and March 1936 (autumn). The first year only six (6) adults and pre-adult nymphs were taken, whilst this year in March thirty-six (36) specimens—including second, third, and fourth (pre-adult) stage nymphs and adults of both sexes—were collected. Unknowingly, the eggs must also have been collected as first stage nymphs hatched out amongst the mossy twigs which were brought down to Brisbane. On the first visit to this area in 1933 various methods of locating the bugs were tried, beginning with vigorously shaking and knocking the branches of small trees and shrubs around the beeches into a paper funnel. This gave no results, so sifting the leaf-mould through a small-mesh net was tried without result. The bark of the beech was next searched thoroughly and also the moss growing on the trunk, but there was no sign of the bugs. A dead, water-soaked, moss-covered twig of the beech was then picked up, and a short search soon revealed five specimens in the moss (Pl. XIV.). Following on this line seventeen were collected in half an hour. The moss on these twigs was *Papillaria kermadecensis* C. Müll. (Pl. XIII. fig. C), and wherever this moss is growing one is certain to find *H. veitchi*. Not a single specimen was ever collected above two inches from the ground—nor were any found on dry moss or in any dry locality. *P. kermadecensis* does not exist in areas subject to dry winds, but thrives in a humidity of 70° and upwards on water-soaked dead twigs and branchlets of the Antarctic beech. Two specimens have been taken off a beech twig covered with another species of moss.

Hemiodacus is both cryptically shaped and coloured, and specimens are extremely difficult to see when on the moss, as they greatly resemble the growing tips of the moss. This resemblance is well shown in the photograph on Pl. XV. fig. 5 of a "moss-tip" or growing point between two adult bugs.

LIFE HISTORY.

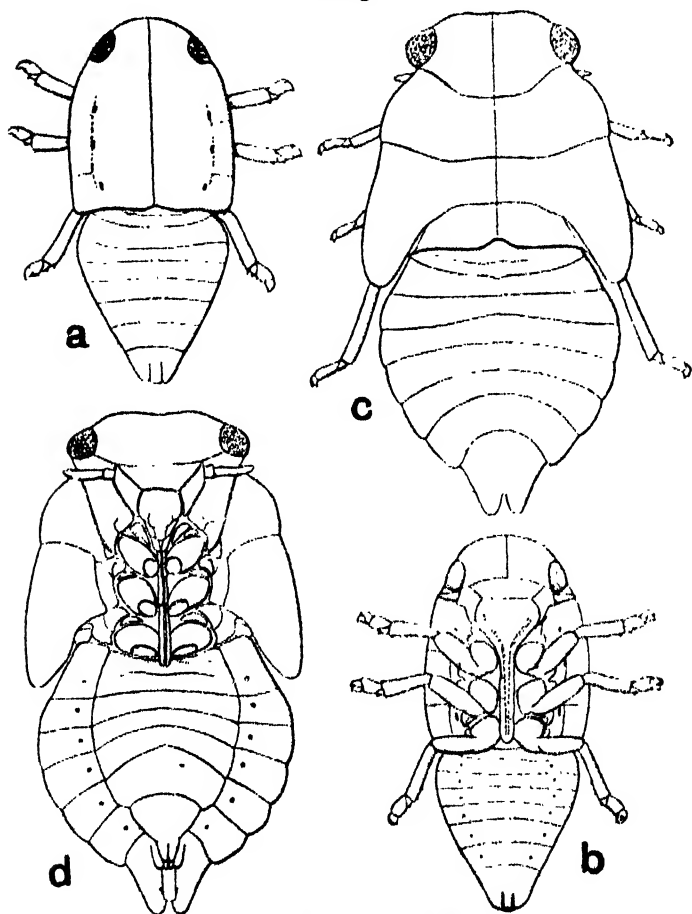
Up to the present it has been found impossible to locate the eggs, but it is the intention of the senior author to concentrate solely on searching for them next year. He is of the opinion that January/February would be best months for the following reasons. Adults collected in October (spring), and brought alive to Brisbane for the purpose of watching, were constantly mating, whereas the ones collected in March (autumn), and treated in the same manner, were never seen in pairs. Collections made in the spring contained no nymphal stage excepting the pre-adult, whereas in the autumn two earlier stages were secured. Adults have predominated in the spring collecting-trips and nymphs in the autumn. These facts appear to indicate that the peak of the egg-laying period should be about January-February (late summer). It seems probable that during this period eggs are inserted into the tissue of the moss-stem, or even into the rotten twigs of the beech by means of the well-developed female ovipositor. These eggs apparently over-winter, and hatch in the early spring, since first instar larvæ were discovered on the 23rd of August amongst the moss brought to Brisbane from the Cainbale Range in March. It is unlikely that these larvæ hatched from eggs laid at Brisbane, since mating takes place in early summer.

First instar nymph. (Pl. XV. fig. 1 ;
text-fig. 1, *a* & *b*.)

Length 1.15 mm. Head distinctly produced in front of eyes, evenly rounded anteriorly, delimited from thorax only ventrally ; eyes narrow, non-prominent ; antennæ single-segmented, conical in shape. The vertex extends ventrally to the base of eyes and is delimited from the frons by a horizontal frontal suture, which extends on each side to the eyes ; the coronal suture is distinct and continuous with a median longitudinal suture down entire length of dorsal surface of thorax. The frons is represented by a distinct transverse sclerite, which is separated from the clypeus by the epistomal suture ; the clypeus is more or less continuous with the labium, the segmentation of which is obsolete. The frons and clypeus are flanked

by a distinct genal sclerite lying below the antenna. Thorax segmented dorsally and ventrally only at the sides. The origins of three pairs of dorsal thoracic pits visible

Text-fig. 1.



Hemiodacus veitohi Hacker.

a, first instar nymph, dorsal view ; *b*, same, ventral view ;
c, pre-imaginal nymph, dorsal view ; *d*, same, ventral view.

just below dorsal surface, one pair belonging to each segment and each placed towards lateral margin (see text-fig. 1 *a*). Legs short, the tibiae subequal to femora,

tarsi two-segmented, claws large and thick, with a large median membranous arolia. Abdomen with nine visible segments and six pairs of spiracles placed ventrally on the third to eighth segments; segmentation of abdomen obscure. No dorsal abdominal glands present.

Second instar nymph. (Pl. XV. fig. 2.)

Length 1.87 mm. Head not produced in front of eyes, more or less truncate anteriorly, delimited from thorax only ventrally; eyes subglobular; antennæ single-segmented, tapering to apex. Frontal and genal sclerites as in first instar. Clypeus showing signs of differentiation into two lateral lobes (the "frontal lobes" of the adult?). Labium three-segmented. Segmentation of thorax complete, the mesothorax laterally much longer than in middle; the metathorax narrow. Three pairs of dorsal thoracic pits now distinctly visible on surface, one pair on each segment and in line with insertion of antenna. A distinct suture is now visible, ventrally, running between insertion of anterior coxa and base of eye. The legs more slender, the tibiæ relatively longer. Abdomen becoming flattened laterally, with a broad connexival area, the segmentation much more distinct basally, but still obscure apically.

Third instar nymph. (Pl. XV. fig. 3.)

Length 2.42 mm. Similar to second instar nymph, but larger; antennæ two-segmented; the mesothorax laterally strongly posteriorly produced to form the wing-pad, the metathorax laterally reduced and narrowed, and lying closely behind posterior margin of meso wing-pad; dorsal thoracic pits * still visible, but becoming obsolete on pro- and metanota. Abdomen strongly flattened and laterally broadly dilated. Segmentation complete, connexival sclerites differentiated ventrally. A seventh pair of spiracles visible on basal segment beneath hind femora. Incipient genitalia visible.

Fourth instar nymph.

Apparently none available, or only four instars.

* These descriptions are made from slides, and it is quite possible that these so-called pits may be the ends of thoracic apodemes and similar to the frontal pits which mark the apodemes of the head.

Pre-imaginal instar. (Pl. XII. fig. B; Pl. XV. fig. 4; text-fig. 1 c & d.)

Length 3.0 mm. Similar to third instar, but larger. The eyes now prominent; the antennæ projecting slightly beyond the anterior lateral margins of pronotum which are distinctly dilated, rostrum four-segmented; the mesothorax posteriorly produced in a wing-pad extending almost to third apparent abdominal segment; metathoracic wing-pads reduced to a very short lobe. Thoracic pits obsolete. Abdomen very broad and flattened, the ventral connexival area very broad. Genitalia well developed.

Time of development.

Nothing at present is known regarding the periods between the moults. *Hemiodæcus veitchi* has been kept alive on the moss *Papillaria kermadecensis* in Brisbane for ten months, and during this time pre-adult nymphs have developed into adults, and copulation has taken place. But it is very difficult to keep these creatures under observation, owing to their cryptic appearance. For instance, a great deal of time was spent endeavouring actually to see the insects feeding, but without success. An attempt was made to send living specimens to the British Museum (Nat. Hist.) for rearing experiments. A number of specimens in moss were sent by air-mail from Queensland to London, but unfortunately they were all dead on arrival.

Adult.

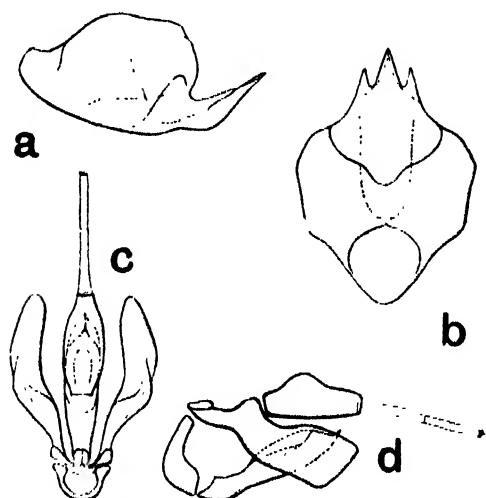
The adult has been described by Hacker, but the male and female genitalia were not dealt with; indeed, the female genitalia have never been described in this family. Accordingly, descriptions of both male and female genitalia are given.

Male genitalia. (Text-fig. 2.)

The ninth segment of pygophor large, well developed. Subgenital plates absent, but ventral posterior margin of pygophor prolonged into a trilobed process, the lateral lobes shorter than the median lobe, but equally acuminate.

Parameres large, symmetrical, apically obliquely truncate seen from side, basally connected to basal plates. *Ædeagus* simple, apically acuminate, much broader and thicker than in *H. lei*. The anal tube is very distinct, tubular, somewhat convexly prominent dorsally and constricted apically, with a distinct narrow tubular eleventh segment, which is invaginated within the anal tube to which it is connected by a membranous tube.

Text-fig. 2.



Hemiodæcus veitchi Hacker.

a, ninth abdominal segment from side ; b, same, from above ,
c, male genitalia from above ; d, same, from side.

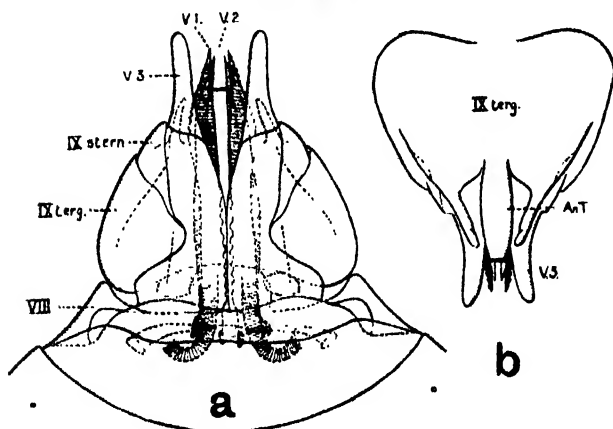
Female genitalia. (Text-fig. 3.)

Dorsal surface of ninth abdominal segment flattened, produced on each side of cylindrical tenth segment (anal tube) into a narrow finger-like process.

Ventral surface of ninth abdominal segment convex, differentiated into three sclerites, probably representing the ninth tergite, ninth sternite, and second valvifers. Subgenital plates absent. Ovipositor complete, consisting of three pairs of valvulæ, the outer pair (third)

forming the ovipositor-sheath, the remaining two pairs first and second valvulae, acuminate and serrate laterally, together forming the shaft. This is a very generalized type.

Text-fig. 3.

*Hemiodocus veitchi* Hacker.

a, female genitalia from below ; b, same, from above ;
v. 1, v. 2, v. 3, first, second, and third valvulae ; An.T., anal tube.

DISCUSSION.

A study of the anatomy of the early stages of *H. veitchi* should be expected to throw considerable light on the homology of the adult structures, and in consequence on the relationships of the Peloridiidæ. The first stage nymph is remarkably Homopterous in appearance, and the position of the coronal and frontal sutures demonstrates that both the dorsal and ventral surfaces of the adult head consist of the vertex. The distinct frontal sclerite refutes the homology of the adult sclerites based by Myers and China on the position of the frontal pits. The adult structures tentatively termed by them the frontal lobes are actually the lateral lobes of the clypeus. The identity of the suture which extends in the second, third, and pre-adult nymphs right across the propleuron from base of eye to base of anterior coxa, is uncertain. It seems unlikely that it is the pleural suture, as it disappears in the adult.

Mrs. M. D. Haviland Brindley has (*in litt.*) criticized the homology of the parts of the adult prosternum given by Myers and China (1929). According to her, their epimeron is the episternum, bounded posteriorly by the pleural suture and the epimeral region; their kat-episternum is the ante-coxale, their an-episternum is the anterior laterale, and their sternum the basisternum and juncasternum combined, all these, except the episternum, forming the anterior coxal bridge. If this is correct, then the aforesaid propleural suture in the nymph must run posteriorly to the epimeral region. Mrs. Brindley expressed the opinion that this type of prosternum was of a primitive (generalized) type. She wrote, "I have not yet found a heteropterous prothorax that shows this primitive condition so clearly."

FUNGI ASSOCIATED WITH *HEMIODÆCUS*.

A very interesting fungus was noticed associated with specimens of *Hemiodæcus* in their natural habitat. The two photomicrographs (Pl. XVI.) will serve to explain its appearance. One photograph shows the distribution of pycnidia over the body and legs of the bug, and the second shows the pycnidia highly magnified. Little is known of this fungus at present, beyond the fact that it belongs to the *Uncinula* group. As to whether it is a parasite or a symbiot, the decision must await a more complete knowledge of the metabolism. The insect in its natural surroundings does not appear to be in any way distressed by the presence of the fungus, and nymphs infested with the pycnidia cast them off with the exuvium when ecdysis takes place.

A second fungus is definitely a parasite, and it has only been seen to affect insects in captivity. When attacked by the fungus the anal portion of the insect becomes distended, and at death is encased in a mass of white hyphæ. There is little doubt that this fungus is *Cordyceps* in its imperfect form, Muscardine. On potato-dextrose-agar white coremia developed, similar to those which are classed in the imperfect genus *Isaria*.

CONCLUSION.

When the type of habitat favoured by *Hemiodæcus* was discovered by the senior author, the Tasmanian Government Entomologist (Mr. J. W. Evans) was informed and advised to search for *Hemiodæcus leai* under similar conditions in Tasmania. His painstaking search has since been rewarded by the discovery in National Park of a number of specimens representing a new species of *Hemiodæcus* in moss, beneath the low branches of small trees of *Nothofagus cunninghami*. This species will be described and discussed by Evans in the near future. Its discovery confirms the conclusion already reached that the Peloridiidæ are muscivorous insects, attached only to mosses in association with *Nothofagus* species. The very primitive and generalised structures found in this group combined with their association with a primitive type of vegetation are very significant. The Peloridiidæ may well be descended in an almost direct line from proto-hemipterous ancestors.

BIBLIOGRAPHY.

- BERGROTH, E. Ent. Mo. Mag. lx. pp. 178-181 (1924).
 BREDDIN, G. 'Ergebnisse der Hamburger Magalhaenischen Sammelreise,' ii. no. 4, Hemipt. pp. 10-13, pl. i, figs. 4, 4 a-f (1897).
 CHINA, W. E. Ent. Mo. Mag. lx. pp. 199-203, figs. (1924).
 —. Ann. & Mag. Nat. Hist. (9) xix. pp. 622-625, figs (1927); (10) x. pp. 392-395 (1932).
 EVANS, J. W. Mem. Nat. Mus. Melbourne, no. ix. pp. 102-104 (1936).
 HACKER, H. Queensland Agric. Journ. xxxvii. pp. 262-263, fig. (1932).
 HAGLUND, C. J. E. 'Svenska expeditionen till Magellänstanderna,' ii. no. 9, pp. 176-178, figs. 1-4 (1897), 1907.
 HORVATH, G. Revue d'Ent. xviii. p. 100 (1899).
 KIRKALDY, G. W. Trans. Amer. Ent. Soc. xxxii. p. 149 (1906).
 MUIR, F. Ent. Mon. Mag. lix. p. 254 (1923).
 MYERS, J. G. Trans. New Zealand Institute, lvi. pp. 465-468, figs. 1-5 (1296).
 — & CHINA, W. E. Ann. & Mag. Nat. Hist. (10) iii. pp. 282-294, figs. 1-5 (1929).
 REUTER, O. M. Acta Soc. Sci. Fennicæ, xxxvii. no. 3, p. 24 (1910); Öfv. Finsk. Vet. Soc. Forh. liv. no. 6, pp. 15 & 50 (1912).

EXPLANATION OF THE PLATES.

PLATE XII.

Hemiodæcus veitchi Hacker.

A. Adult.

B. Pre-adult nymph, $\times 32$.C. Pre-adult nymph showing distribution of fungal pycnidia, $\times 32$.

PLATE XIII.

- A. View taken from Wanungara Lookout : Mt. Hobwee and Hobwee Lookout on left, Mt. Warning in distance on right.
- B. Antarctic beeches (*Nothofagus moorei*) at Lightning Falls Turnoff. Note litter of dead twigs and branchlets on ground.
- C. A typical dead branch of *Nothofagus* covered with moss, *Papillaria kermadecensis*, the habitat of *Hemiodocus veitchi*, about three-fourths natural size.

PLATE XIV.

- A. Two adults and nymph (centre) of *Hemiodocus veitchi* in situ on the moss *Papillaria kermadecensis*, $\times 4$. Note cryptic appearance.
- B. Two adults of *Hemiodocus veitchi*, enlarged to show resemblance between leaves of the moss and hemelytra of the bug, $\times 8$.

PLATE XV.

Hemiodocus veitchi Hacker.

1. First instar nymph, $\times 30$; 2. Second instar nymphal exuvium, $\times 30$; 3. Third instar nymphal exuvium, $\times 20$; 4. Pre-imaginal nymph, $\times 20$; 5. Two adults on either side of a moss-tip to show cryptic resemblance, $\times 8$.

PLATE XVI.

- A. Adult of *Hemiodocus veitchi*, showing distribution of fungal pycnidia, $\times 30$.
- B. Fungal pycnidia, enlarged. Note mycelium on surrounding tissue, $\times 250$.

[Photographs by I. W. Helmsing.]

XLVII.—*Papers on Oriental Carabidæ*.—XXXI.

By H. E. ANDREWES.

TRITRICHIS, gen. nov.

This new genus is closely allied to *Feronia* (= *Platysma* = *Pterostichus*), and presents nearly all the characters of that well known genus, but must be excluded from it because the apical joint of the labial palpi is dilated in the ♂, and the penultimate joint has an additional seta (sometimes more than one) at apex. *Lesticus* is also excluded, for the frontal foveæ and mentum are like those of *Feronia*, and the border of the prothorax, though fairly stout, is not unusually thickened or dilated behind.

GENOTYPE : *Tritrichis deliciata*, sp. n.

Key to the Species.

- 1 (6). Prothorax with the basal foveæ moderately deep, at least for a short distance, and no engraved rectangular line on each side within the hind angles; meso- and metatarsal joints outwardly sulcate, joint 5 setulose beneath.
- 2 (5). Prothorax with its sides rather strongly rounded, the lateral borders not, or only vaguely, crenulate, the hind angles right, the basal foveæ moderately deep for a short distance only; sides of elytra not or barely sinuate behind the shoulders; penultimate ventral segment very finely bordered. Length 14.5-16 mm.
- 3 (4). Elytra black, angulate at shoulder, without dorsal pores. Manipur *deliciata*, sp. n.
- 4 (3). Elytra dark purple, dentate at shoulder, with a single small dorsal pore. Ruby Mines *felix*, sp. n.
- 5 (2). Prothorax with its sides gently rounded, the lateral borders slightly though evidently crenulate, the hind angles somewhat obtuse, the basal foveæ moderately deep and long; elytra black, their sides evidently sinuate behind the shoulders; penultimate ventral segment unbordered. Length 17.5-18.5 mm. Assam *inflata*, sp. n.
- 6 (1). Prothorax with the basal foveæ hardly impressed and with an engraved rectangular line on each side within the hind angles; meso- and metatarsal joints not outwardly sulcate, joint 5 not setulose beneath.
- 7 (8). Frontal furrows diverging strongly behind; basal foveæ of prothorax faint, but visible; elytra violet, the border dentate at shoulder, the striae very finely punctate. Length 19-20 mm. Tonkin *glymmigera*, sp. n.
- 8 (7). Frontal furrows diverging slightly behind; basal foveæ of prothorax obsolete; elytra black, the border not dentate at shoulder, the striae impunctate. Length 15 mm. Tonkin *sequa*, sp. n.

Tritrichis deliciata, sp. n.

Length 14.5-15.5 mm.; width 4.4-4.6 mm.

Black, shiny: palpi slightly ferruginous.

Head convex, with short deep frontal furrows, diverging behind, eyes rather prominent, mentum with a bifid tooth, behind which are two fairly deep setiferous pores, submentum raised, with a seta at each end, and a pair of rounded pores in the middle, palpi with the last joint ♂ dilated and truncate at apex, more so in the labials than

in the maxillaries, penultimate joint of labials with an additional seta near apex, antennæ short and stout, barely reaching base of elytra, joint 1 as long as 3, surface smooth, some vague oblique striation at sides of vertex. *Prothorax* convex, not quite a half wider than head, very little wider than long, base with its sides a little oblique, evidently wider than apex, which is bordered, widest at middle, sides bisetose (front setæ abraded), with a faintly crenulate border, strongly and evenly rounded up to a point quite close to base, lateral channels deep, rounding and extending a little beyond the hind angles, which project on each side as a fairly sharp, rectangular tooth; median line moderately deep, transverse impressions obsolete, basal foveæ single, linear, parallel, visible from base to middle, though moderately deep for a short distance only, surface smooth, one or two faint punctures on each side of base, which is vaguely transversely striate, a raised area on each side between the foveæ and the angles. *Elytra* convex, oval, about a fifth wider than prothorax, nearly two-thirds longer than wide, border obtusely angulate at shoulder and extending inwards to stria 1, no inner plica visible behind; striæ deep, impunctate, 7 with an umbilicate pore near apex, scutellary striae vestigial, containing an umbilicate pore and placed between stria 1 and stria 2; intervals convex, 7 very convex and narrower near base, 8 very narrow in front and behind, costate near apex, no dorsal pores, surface smooth and impunctate. Microsculpture isodiametric, clear on the elytra, faint on the prothorax, hardly visible on the head. Mesosternum and metepisterna punctate, the latter as wide as long, metasternal process bordered, a deep longitudinal sulcus behind it (♂); venter longitudinally sulcate at base (♂), the penultimate segment extremely finely bordered, apical segment with a single seta on each side in both sexes, ♂ with a central longitudinal costa running from middle to apex, the surface around it very rugose; protarsi with the three basal joints produced on the inner side, meso- and metatarsal joints slightly carinate on the outer side, with a shallow sulcus on each side of the carina, joint 5 setulose beneath.

MANIPUR (*Doherty*), 2 ex., ♂♀, from the Fry Collection. Type in the British Museum.

Tritrichis felix, sp. n.

Length 16 mm. ; width 5 mm.

This species is striking like *F. deliciata*, just described, but differs in some important characters. The size and colour are almost the same, but the palpi are more evidently ferruginous, and the elytra have a purplish tint. The neck is somewhat tumid and is slightly constricted behind the eyes, the labial palpi ♀ (only sex known) are moderately dilated, rather more so than in *deliciata*. The prothorax is a little narrower, less strongly rounded at sides, the border not crenulate, the foveæ slightly deeper and containing one or two slight punctures, no raised area between them and the angles. The elytra have a distinct tooth at shoulder, the striæ are a little less deep, and the intervals not quite so convex, 7 and 8 both carinate at apex, a small dorsal pore on 3 at about two-thirds, adjoining stria 2. The proepisterna and sides of metasternum have a few punctures ; the venter ♀ has a longitudinal sulcus similar to that in the ♂ of *deliciata* ; the carina and sulci on the meso- and metatarsi are slighter.

BURMA : Ruby Mines (*Doherty*), 2 ex., ♀♀. Type in the British Museum.

Tritrichis infissa, sp. n.

Length 17.5–18.5 mm. ; width 5.5–6 mm.

Black : apex of palpi ferruginous.

Head convex, neck somewhat tumid, clypeus transversely depressed, frontal foveæ short, deep, foveate, a slight carina on each side opposite the eyes, which are fairly prominent, mentum with a bifid tooth, a pair of setæ beneath it, a fovea on each side, submentum raised, a seta at each extremity, labial palpi ♂ with the apical joint dilated, penultimate joint with the two normal setæ and an additional one at apex, antennæ stout, extending rather beyond base of elytra, surface smooth, a few slight wrinkles on vertex. *Prothorax* convex, a half wider than head, only slightly wider than long, widest a little before middle, base emarginate at middle, its sides slightly oblique, barely wider than apex, sides bisetose, with a reflexed, evidently crenulate border, gently rounded in front, slightly sinuate close to base,

hind angles sharp, but a little obtuse; median line moderately impressed, vaguely crenulate, transverse impressions slight, basal foveae single, moderately deep, parallel, not quite reaching base, where they bend a little outwards, a slightly raised area on each side between them and the hind angles, surface faintly striate, transversely on disk, longitudinally along front margin. *Elytra* convex, a little dilated behind and widest just behind middle, a fourth wider than prothorax, three-fifths longer than wide, border rounded at shoulder and extending inwards to stria 1, sides with a long sinuation behind shoulder, and a more evident one near apex, the inner plica not visible from above; striæ very deep, impunctate, scutellary striole reduced to a long umbilicate pore, adjoining stria 2, another umbilicate pore in 7 near apex; intervals very convex, the inner wider than the outer ones, 8 carinate near apex, no dorsal pores, surface smooth. Microsculpture of the elytra and head isodiametric, the meshes on the head very small; the meshes on the prothorax are also very small, but transverse. Underside impunctate, the pro- and metasterna, and the base of venter longitudinally sulcate; metepisterna as long as wide; penultimate ventral segment unbordered, last segment ♂ strongly rugose on the middle of the apical half, with a tubercle at apex, ♀ only slightly rugose, a single seta on each side in both sexes; basal joints of meso- (slightly) and metatarsi outwardly sulcate, joint 5 setulose beneath.

ASSAM: Khasi Hills (Deutsch. Ent. Mus.), 2 ex., ♂♂; Shillong (*Godwin-Austen*—Ind. Mus.), 2 ex., ♂♀. The type is in the Deutsch. Ent. Mus., Berlin-Dahlem; cotypes in the Indian Museum, Calcutta, and in my collection.

Tritrichis glymmigera, sp. n.

Length 19–20 mm.; width 6.5–7 mm.

Black, shiny, elytra dark violet.

Head convex, with short, deep, frontal furrows, diverging sharply behind, mentum with a bifid tooth, a pair of small setæ behind it, submentum with a seta at each end and two large rounded pores at middle, last joint of maxillary palpi moderately dilated, truncate at apex, last joint of labial palpi ♂ short, securiform, penultimate

joint with one or two additional setæ at apex, antennæ stout, extending a little beyond base of elytra, joint 1 as long as 3, surface smooth. *Prothorax* convex, two-thirds wider than head, but only a little wider than long, base emarginate at middle, as wide as apex, both unbordered, widest at middle, sides bisetose, with a fairly thick border, rounded from apex to base, with the barest trace of sinuation before the base, lateral channels deep, hind angles obtuse and a little rounded, a short, deep, engraved line on each side just within the angle, extending a little way forward and along base, forming a right angle, and separated from the side by a slight ridge; median line deep, no transverse impressions, basal foveæ long, but very faintly impressed, surface smooth, but slightly uneven. *Elytra* convex, oval, a little wider than prothorax, about three-fourths longer than wide, border forming a slight obtuse tooth at shoulder and extending inwards to stria 1, no inner plica visible behind; striæ deep, very finely and just perceptibly punctate, 7 with an umbilicate pore near apex, scutellary striae vestigial, between stria 1 and stria 2; intervals convex, much more so at sides, 8 very narrow, carinate behind, no dorsal pores, surface smooth and impunctate. Microsculpture of the elytra formed by meshes a little wider than long; on the prothorax the meshes are very fine and strongly transverse, on the head isodiametric and very faint. Mesosternum and metepisterna punctate, the latter hardly longer than wide, metasternal process bordered; apical segment of venter with a single seta on each side in both sexes; protarsi with the basal joints produced on the inner side, meso- and metatarsal joints not outwardly sulcate, joint 5 not setulose beneath.

TONKIN: Chapa (*R. Vitalis de Salvaza*), 3 ex., ♂♀♀. The type (♂) is in the British Museum; a cotype (♀) is in my collection.

Tritrichis æqua, sp. n.

Length 15 mm.; width 4.75 mm.

In form almost exactly like *T. glymmigera*, but the size is much smaller, and the colour entirely black. *Head* similar, but the frontal furrows are less deep and diverge much less behind. *Prothorax* with the hind angles

more obtuse and more rounded, the median line finer, the basal foveæ obsolete, the rectangular impressed line on each side within the hind angles not so deep. *Elytra* similar, but the border hardly makes even an angle at the shoulder, the striæ are impunctate, the intervals rather less convex, both on disk and at sides. The microsculpture of the elytra is formed by meshes two or three times wider than long, but on the head and prothorax it is similar. The underside and legs are also similar.

TONKIN: Dong-Nan (*R. Vitalis de Salvaza*), 1 ex., ♂, in the British Museum.

XLVIII.—*Descriptions and Records of Bees.*—CLX.

By T. D. A. COCKERELL, University of Colorado.

THE holotypes of the new species described below will all be found in the British Museum.

Heriades humilis, sp. n.

Male.—Length nearly 5 mm., anterior wing nearly 4.

Black, including mandibles, antennæ, tegulæ, and stigma; eyes very dark brown; head circular seen from in front; mandibles robust, bidentate at apex, and without a salient inner angle; clypeus densely punctured, the punctures running in rows, the lower margin straight, even, shining; supraclypeal area large, triangular, sparsely punctured, shining, contrasting with the dull clypeus; sides of face densely covered with white hair; mesothorax coarsely punctured, about the same as front, with a median sulcus; scutellum shining, the punctures rather smaller than on mesothorax; axillæ with long spines. Wings greyish-hyaline; nervures black; second cubital cell receiving first recurrent nervure some distance from base (equal to rather less than half length of intercubitus), and second recurrent somewhat nearer to apex. Abdomen closely punctured; first tergite with white hair at sides of margin, second with an entire band, but the rest bandless, though the fourth to sixth are covered with a fine hoary pubescence; margin of sixth tergite straight and simple, but there is a depression on each side before the margin.

Tanganyika Territory : Dar-es-Salaam, June 9, 1932
(*J. Ogilvie*).

Very close to *H. communis* Ckll., from the Belgian Congo, but differing by the smaller punctures of clypeus and the contrasting triangular supraclypeal area. The more southern *H. bevisi* Ckll. differs in the clypeal margin and mandibles, and *H. globiventris* Friese in the supraclypeal area and clypeal margin. *H. mandibularis* Friese has much longer antennæ and modified front and middle legs. *H. orientis* Strand appears to be different, judging from Strand's description. *H. humilis* is really very like the European *H. crenulatus* Nyl.; on comparing a specimen of that species, collected by Lichtenstein at Montpellier, I found *H. humilis* to differ by the mesothorax not so strongly impressed in middle, tubercles less projecting, and especially the non-tuberculate clypeal margin.

Heriades politissimus, sp. n.

Female.—Length about 7 mm., anterior wing 5.

Black, including mandibles, antennæ, and tegulæ; no axillary spines; wings dilute fuliginous; ventral scopa light yellow. Head very broad oblong, with large and long mandibles, which have two teeth (the inner short and obtuse) at apex, and the inner angle very prominent, directed upward, and constituting a third tooth; long dull white hair at sides of face; clypeus peculiar, the upper part highly polished, with well-separated rather large punctures, running more or less in transverse rows, each side below with a dull, finely and densely punctured patch, the margin with a prominent central tooth (from which a distinct ridge runs upward), and on each side of this is a broad rounded lobe; lower part of supraclypeal area polished; front dull, with a slight sulcus; eyes brown; occipital region and cheeks enlarged, the cheeks shining anteriorly; mesothorax densely and coarsely punctured, shining posteriorly; disc of scutellum polished; basal band of metathorax with a series of shining pits, separated by strong plicæ; stigma large; first recurrent nervure far from base of second cubital cell, but second almost at the end; hind tibiæ with a line of very short white

hair behind. Abdomen shining, but well punctured; basin of first tergite sharply defined; lateral hind margins of first tergite with a broad band of dense white hair; second to fourth tergites with weak hair-bands, fifth with none; sixth densely and minutely punctured, not tomentose.

Cape Province: Bot River, Nov. 10, 1933 (*J. Ogilvie*).

The colour of the ventral scopa suggests *H. capicola* Strand, but this has quite a different clypeus and a hair-band on fifth tergite. It is allied to *H. livingstonei* Ckll., but the clypeus is different. The clypeus also at once separates it from *H. xanthogaster* Ckll.

Heriades sulcatiferus, sp. n.

Male.—Length 7 mm., anterior wing 5.

Black, including mandibles, antennæ (flagellum very faintly brownish beneath), and tegulæ; eyes pale green; wings strongly dusky; axillæ smooth and polished, pyriform, pointed but not spined. Head circular seen from in front, but face narrow, the sides with dense pure white hair, a beard of white hair over clypeus, and a long tuft of hair from between antennæ extending over front; mandibles bidentate, with no salient inner angle; clypeus not keeled, excessively densely, reticulately, punctured, the punctures running in lines, the lower margin straight and simple, but a small nodule on the middle above the margin; sides of front with broad trough-like depressions; supraclypeal area highly polished; the nodular labrum, just below the shining edge of the clypeus, looks like a process of the latter; mesothorax and scutellum polished, coarsely and rather sparsely punctured, the hind margin of scutellum with a series of plicæ, simulating the basal band of metathorax; basal band of metathorax with a series of shining pits, separated by strong plicæ; hind tibiæ with a conspicuous band of pure white hair posteriorly; hind tarsi with reddish hair on inner side and apical joint red. Abdomen with first three tergites coarsely punctured, the punctures not much smaller than on thorax; fourth and fifth densely punctured and striate, dullish, with fine pruinose pubescence; basin of first tergite sharply defined; first two tergites with bands of pure white hair, broad at sides, and very

weak in middle; margin of third very minutely and inconspicuously ciliate; sixth tergite unarmed; long tufts of pure white hair project at sides of abdomen.

Belgian Congo (Katanga): Kafubu Mission, Sept. 1931 (*J. Ogilvie*).

Evidently allied to *H. sulcatulus* Ckll., based on a female from Lesse on the Semliki River. It may prove to be the male of *H. sulcatulus*, but it is larger, with more coarsely punctured abdomen, and with conspicuous patches of pure white hair at sides of face. The localities are far apart.

Heriades globiventris Friese.

Transvaal: Yokeskei River, Johannesburg (*J. Ogilvie*).

Heriades wellmani Cockerell.

Cape Province: Upington, Dec. 7, 1933, ♀ (*J. Ogilvie*).

Heriades brachypterus, sp. n.

Female.—Length about 7.5 mm. (abdomen extended), anterior wing 4.8 mm.

Black, including mandibles, antennæ (flagellum faintly brown beneath), and tegulæ; no axillar spines, but lateral upper corners of metathorax projecting; ventral scopa shining white. Head round seen from in front; mandibles with the cutting-edge very oblique, with four teeth, the third small; a dense patch of white hair at each side of face; clypeus broad, dull, and minutely punctured, with a shining band at upper end; clypeal margin with four little tubercles, surrounded by short hair, but above is a sort of false margin or ridge, so that, looked at from above, the margin seems entire; vertex very coarsely punctured; front with a median sulcus; basal band of metathorax with a series of shining pits, the band incised and almost interrupted in middle; mesothorax and scutellum shining, very coarsely punctured. Wings hyaline, brownish apically; stigma broad but short; basal nervure falling short of nervulus; second cubital cell long, receiving first recurrent nervure far from base, second only about half as far from apex. Hind coxæ broadened and flattened; basin of first tergite sharply defined; first three tergites strongly fringed

with flattened white hairs, but fourth only with minute bristles, some flattened at sides; first three tergites with punctures smaller than those of mesothorax, very dense on upper side of first; fifth and sixth hoary with fine short hair.

Bechuanaland: Palapye, March 4, 1934 (*L. Ogilvie*).

A species with long abdomen and very short wings, closely related to *H. sulcatifrons* Ckll., which is much more robust, and does not show the clear white bands on first three tergites. This seems to be a resin-worker, as I find at the bases of the mandibles lumps of orange gum or resin.

Heriades (Noteriades) striatibasis, sp. n.

Female.—Length about 8.5 mm., anterior wing 4.6.

Black, including mandibles and antennæ (flagellum faintly brownish beneath), the sutures of the extended abdominal tergites narrowly reddish; tegulæ reddish brown. Clypeus dull and densely punctured, with a strong median keel, reaching the apex; margin thickened, undulate, but without distinct tubercles; mandibles apically tridentate, and with an inner angle; supra-clypeal region very coarsely punctured, without any keels; front coarsely punctured, dull in middle, with no median sulcus; vertex very coarsely punctured, with no smooth spaces, a shining line behind middle ocellus; sides of face (not extending on clypeus) densely covered with pure white hair; mesothorax shining, strongly but not densely punctured; scutellum in complete contrast, dull, with projecting margin, very coarsely rugose or tuberculate all over; a band of white hair in scutello-mesothoracic suture; mesopleura polished, with well-separated punctures; basal band of metathorax minutely striate, widened in middle; tubercles angular, with a patch of white hair behind, connected by a narrow stripe with a large patch behind wings; axillæ not spined. Wings short, brownish hyaline; stigma short; basal nervure falling far short of nervulus; second cubital cell receiving first recurrent nervure a moderate distance from base, the second nearer apex; hind tibiæ very broad, strongly punctured. Abdomen dullish, the sharply defined basin of first tergite very large, not leaving much

dorsal surface in the middle line; sides of first tergite with broad white hair-bands anteriorly and posteriorly; second and third tergites with strong white bands at sides, failing in middle; fourth and fifth with weak bands at sides; second tergite with a strong transverse sulcus; third and fourth with strong punctures on posterior part; fifth and sixth with greyish bands of fine hair basally; ventral scopa white, unusually short.

Orange Free State: Donkerpoort, April 8, 1934 (*J. Ogilvie*).

In my table of *Noteriades* this runs to the vicinity of *H. tricarinatus* (Bingham), but lacks the keels on front. It is quite distinct from the six other known species. The scutellum is suggestive of *H. ekuivensis* Ckll.

Heriades crassulus, sp. n.

Female.—Length about 8 mm., anterior wing 5, width of thorax about 3 mm.

Very robust, black, including mandibles, antennæ, and tegulæ. Head circular seen from in front; clypeus dull and densely punctured, except the shining lower margin and a T-shaped shining mark at upper end; clypeal margin with five little nodules, the inner lateral ones largest, the median one slightly emarginate; eyes very dark brown, almost black; sides of face with long hair; mandibles very broad, with a stout apical tooth and a salient inner angle, but the margin between edentate, though undulate; front excessively densely punctured and dull, with no sulcus; thorax with dull white hair, abundant on pleura; mesothorax and scutellum very coarsely and densely punctured (at middle of disc of mesothorax posteriorly the punctures are well separated, showing the shining surface); axillæ with strong curved spines; basal band of metathorax very slender, wider at sides, minutely and rather obscurely striate. Wings dilute fuliginous, stigma and nervures black; basal nervure meeting nervulus; second cubital cell receiving first recurrent nervure far from base, second near apex. Abdomen broad, basin of first tergite sharply defined; first tergite with a conspicuous white hair-band at each side; second to fourth with weak narrow bands of flattened hairs; second tergite with a strong transverse

sulcus, and the punctures on its shining disc smaller and less dense than on third; ventral scopa very pale yellowish, white at sides.

Orange Free State: Ficksburg, Feb. 26 to March 1, 1932 (*Alice Mackie*).

Very close to *H. marleyi* Ckll., from Natal, but larger, with no second tooth at end of mandibles. I am not sure it is more than a local race of *H. marleyi*. The mandibles separate it from *H. freydessneri* Schlett. The mandibles and clypeal margin suggest *H. speculiferus* Ckll., but that does not have spined axillæ, and has a much smaller head, with shining clypeus.

Heriades communis Cockerell.

S. Rhodesia: Victoria Falls, Sept. 1931, ♀ (*L. Ogilvie*).

A common species in Katanga.

Heriades (Noteriades) bicornutus Friese.

Bechuanaland: Lobatsi, two females, March 16, 1934 (*L. Ogilvie*).

Heriades albobarbatus, sp. n.

Female.—Length about 6 mm., anterior wing 4 mm.

Black, including mandibles, antennæ, and tegulæ; wings-fulginous, with pink and green iridescence; axillæ not spined; ventral scopa white. Head large (diameter 2 mm.), round seen from in front; face, including clypeus, covered with long white hair, but the clypeus has a slender shining keel down the middle, not hidden by hair; clypeal margin convex in outline, thickened, not tuberculate; mandibles tridentate, the teeth about equidistant; front very densely punctured, without a sulcus; mesothorax polished, the punctures on disc rather widely separated; scutellum densely punctured and hardly shining; base of metathorax highly polished, contrasting with the dull postscutellum; mesopleura with much white hair; stigma small; basal nervure meeting nervulus; second cubital cell receiving first recurrent nervure far from base, the second some distance from apex. Abdomen shining, finely punctured, second tergite without a transverse sulcus; basin of first tergite clearly defined; first tergite with broad white hair-bands

at sides only ; second with slender bands, also confined to sides ; third with traces of bands at sides ; fifth and sixth hoary with fine hair. The thin dorsal hair of head and thorax has a dusky appearance.

Cape Town : Lion's Head, Oct. 29, 1933 (*J. Ogilvie*).

By the hairy face, this resembles *H. prionsa* (Cameron), but differs by the smaller size, dark wings, and the structure of mandibles and clypeus. By the mandibles it resembles *H. angustulus* Ckll., but that is much smaller (4 mm. long), with greyish wings. The clypeal margin suggests *H. larvatus* Friese, which is smaller, and has axillary spines. The hairy face, dull scutellum, and structure of mandibles distinguish it from *H. chubbi* Ckll.

Heriades usakensis, sp. n.

Male.—Length about 6 mm., anterior wing 4.4 mm.

Black, including mandibles, antennæ, and tegulæ ; head round seen from in front ; antennæ reaching to middle of mesothorax ; sides of face with dense pure white hair, clypeus with thin hair, giving it a greyish appearance, but pure white seen from above ; clypeus dull and finely punctured, the apical margin with three small lobes, the middle one obtusely dentiform, the lateral ones short and broad, about as far from the middle one as the length of one ; mandibles edentate, with the apex pointed, the cutting edge concave, and the inner corner about a right angle ; front dull, its upper part with strong punctures ; vertex glistening ; mesothorax and scutellum shining, with strong well-separated punctures ; axillæ without spines ; basal band of metathorax with a series of quadrate shining pits, separated by strong plicæ. Wings clear hyaline, the stigma dusky reddish ; basal nervure falling far short of nervulus ; second cubital cell receiving first recurrent nervure a moderate distance from end, second nearer apex ; small joints of tarsi reddened. Abdomen well punctured, tergites 1 to 5 with clear white hair-bands ; sixth tergite turned downward and inward, with an entire margin, but no foveæ ; venter apparently unarmed.

S.W. Africa : Usakos, Jan. 16, 1934 (*J. Ogilvie*).

Exceedingly like *H. pellucidus* Ckll., but with a different clypeal margin and the face distinctly narrower.

Heriades pellucidus Cockerell.

Male.—Two from Okahandja, S.W. Africa, Jan. 23, 1934 (*J. Ogilvie*).

The description is from the larger one, about 6 mm. long, anterior wing 4.4 mm. The other is about 5 mm. long.

Black, including mandibles, antennæ, and tegulæ; head round seen from in front; face and front covered with dense pure white hair; cheeks narrow, covered with white hair; mandibles with a broad apical tooth or lobe, separated by an angular incision from the prominent, salient, rectangular inner corner; clypeal margin not tuberculate, appearing straight and quite simple, but from beneath the margin appears a broadly emarginate short shining process; mesothorax and scutellum shining, with strong well-separated punctures; axillæ sharply pointed, but without outstanding spines; basal band of metathorax very narrow, with distinct well-separated plicæ. Wings clear hyaline, the stigma dusky reddish; basal nervure meeting the oblique nervulus; second cubital cell receiving recurrent nervures very near base and apex. Abdomen shining, rather weakly punctured, the tergites with narrow white hair-bands; apical tergite (seventh) shining, with a thickened entire margin, and no foveæ; stipites long, narrow, strap-shaped, straight, far apart, reddish with the end darkened; sagittal rods slender, parallel, close together; fourth sternite with a sharp spine in middle; fifth pallid.

The clypeus resembles that of *H. lobatus* Ckll., which is readily distinguished by the broad head and structure of abdomen. The hind coxæ have projecting ends, as described for *H. pellucidus*. Although *H. pellucidus* was described (1920) from Natal, the Okahandja insect seems to me to be the same. *H. jonesi* Friese (1922) is, perhaps, also the same.

Thaumatosoma filiferum Cockerell.

Cape Province: Calvinia, an unusually small male (*J. Ogilvie*).

Afrostelis otavicus, sp. n.

Male.—Length about 4 mm., anterior wing 3 mm.

Black, including mandibles (except the teeth), antennæ (flagellum faintly brown beneath), and the large very strongly punctured tegulæ; clypeus and supraclypeal area convex, densely punctured, the clypeal margin a little irregular, with no smooth band, but not tuberculate; mandibles conspicuously hairy, bidentate, the teeth red, no salient inner angle; head seen from in front round, conspicuous white hair at sides of face; vertex coarsely and densely punctured, with no smooth space; flagellum thick and remarkably short, obtuse at end, the basal joints transverse; mesothorax and scutellum shining, mesothorax with a median sulcus, reaching nearly to hind end; scutellum swollen, very prominent; punctures of mesothorax very coarse and dense, on mesothorax in longitudinal rows; posterior margin of scutellum with a thin fringe of long hairs; axillæ not spined, and no dentiform process at sides of metathorax. Wings hyaline, conspicuously clouded at apex; second cubital cell very long, receiving first recurrent nervure far from base, but second going a little beyond end of cell; femora shining. Abdomen short and obtuse, the apical part hoary; margins of first three tergites narrowly pallid, without hair-bands as seen from above, but thin bands at sides; last sternite with a prominent median tooth; apical part of venter with long white hair.

S.W. Africa: Otavi, Dec. 27, 1933 (*J. Ogilvie*).

This minute species is easily distinguished from *A. ogilviei* Ckll. by the pale wings; it is nearer to *A. regularis* Ckll., from the Belgian Congo, but is very much smaller. *A. kigonserana* (Fries), from near Lake Tanganyika, is as small, but has brown legs.

Crociaspidia confessa, sp. n.

Female.—Length about 13 mm., anterior wing 10.

Black, including antennæ; mandibles with a dark red subapical band; clypeus dull, very minutely punctured, with a faint median keel; supraclypeal area with the lower margin shining; cheeks and sides of face covered with white hair; front entirely dull; mesothorax and scutellum entirely dull, except the scutellar lobes,

which are brownish and shining; postscutellum with a pair of large lobes, broadly joined at base; metathorax entirely dull; tegulæ large, very dark brown, the paler rounded posterior ends covered with fine white tomentum; anterior wings dilute fuliginous, paler at base; basal nervure meeting nervulus; second cubital cell about square, receiving recurrent nervure near end; legs with white hair, including outer side of hind tibial scopa (scopa all black in *C. nigripes* Friese). Abdomen with broad pure white tegumentary bands at sides of first tergite; grey bands on tergites 2 to 4, on second with nearly middle third missing, on third greatly narrowed, and almost broken in middle, on fourth entire; apex with red hair; sternites with reddish hair-bands. Doubtless when in the best condition all the bands are white.

Cape Province: Swellendam, Nov. 1933, two (*R. E. Turner*).

C. fasciata (Friese), described from the Transvaal, was based on the male, which, like the present insect, has fuliginous wings. In *C. fasciata* the bands have faint bluish-green tints, and there is some red on the antennæ. *C. fasciata mackiewi* Ckll. has quite differently coloured wings and pale tegulæ, suffused with red, while the slender shining raised line on clypeus is confined to less than upper half. *C. albopicta* Ckll., from Kenya, is also allied.

XLIX.—*Some Remarks on the Structure, Habits, and Distribution of the Benthonic Sergestid Sicyonella Borradaile (Crustacea, Decapoda).* By MARTIN D. BURKENROAD, Bingham Oceanographic Laboratory, Yale University.

SINCE the description by Calman (1) of the holotype male of *Sicyonella elegans* from Torres Strait, no further records of this species have been published; and, indeed, Calman (2) in a succeeding paper having concluded his form to be a juvenile of *S. maldivensis* Borradaile, the form has had no definite standing. The discovery in Ceylon of an adult male and in the Red Sea of an adult male and female, which seem to agree with Calman's description in critical characters, is therefore

of interest not only as greatly extending the range of the species, and as confirming Hansen's (3) suspicion that *S. elegans* might be distinct from *S. maldivensis*, but as indicating *S. elegans* to be a probable synonym of *S. inermis* (Paulson).

The Ceylonese specimen was dredged on the night of February 26, 1936, in the Gulf of Mannar, by Dr. A. H. Malpas, Director and Marine Biologist, The Colombo Museum. The Red Sea specimens were taken near the Biological Station at Ghardaqua, on *Halophila*, in about four fathoms, February 1936, by Dr. M. Ramadan of the University of Cambridge. To Dr. Malpas and to Dr. Ramadan I wish to express my deep indebtedness for this material, and to the latter also for certain information as to *S. maldivensis*, which is discussed below.

The Ceylonese specimen, a male with joined petasmat endopods, has a carapace length (excluding the rostrum) of 6.5 mm., a rostrum of 0.45 mm., and a total length of about 27.5 mm. The Red Sea male and female have carapace lengths respectively of 6.3 and 7.9 mm., rostra of 0.4 and 0.5 mm., and total lengths of 25.6 and 31.6 mm.

The petasma of both males is fairly well represented by Calman's figure, except that a band along the inner margin of the anterior surface of the capitulum of pars media is free of the tubercles which cover the remainder of this side, and that pars externa does not attain to more than four-fifths of the capitulum. It may be noted that there is a minute, fleshy, conical protuberance laterally at the juncture of the capitulum and peduncle of pars media, not indicated in Calman's figure, which is probably a rudimentary processus ventralis. The petasma of the Ceylonese differs from that of the Red Sea male in a few details, as follows :—

(1) The laterally curved tip of its capitulum is slightly shorter than that of the Red Sea specimen, being about the same as in Calman's figure.

(2) The proximo-median anterior corner of its capitulum appears as a gently rounded heel-like projection ; whereas in the Red Sea specimen this corner is produced to a sharp point.

(3) The median part of the distal margin of its pars media slopes from the median edge proximally, rather than distally as in the Red Sea specimen; and, consequently, the lateral part of the distal margin of its pars media appears to rise higher above the median part than in the Red Sea male.

What the significance may be of these slight differences in petasmal structure between Ceylonese and Red Sea males is uncertain. I am inclined to suspect that, as in the neritic *Acetes*, fairly well-defined local forms occur within widely ranging species of *Sicyonella*.

In other features, the present material displays a number of probably unimportant differences from Calman's description and figure—particularly in regard to the rostrum, which is distinctly elevated and the anterior dorsal tooth of which is smaller than the posterior; the sixth pleonic tergum, which terminates in a minute median tooth; and the telson, which bears only four pairs of lateral spines. According to Calman's measurements of *S. elegans*, the ratios of the diameter of the cornea to that of the base of the ocular peduncle, and of the length of the propodus of the third chela to its diameter, respectively 1.7 and 10.0, are slightly less than in the present, perhaps more mature, Ceylonese and Red Sea males, in which these ratios are respectively 2.0, 1.9, and 10.5, 11.7. In the Red Sea female these ratios are 1.8 and 10.8.

Whether it is *S. elegans* (Calman) or *S. maldivensis* Borradaile (or even, as remote possibility, *S. antennata* Hansen), which is in fact a synonym of *S. inermis* (Paulson), is not at this time finally determinable, inasmuch as it is possible that both species may occur in the Red Sea. Since, however, the females of *Sicyonella* recorded from that region by Balss (4) and by Cecchini (5) are as likely to be referable to *S. inermis* as to *S. maldivensis*, Calman's is the only form that can at present be definitely stated to occur in the type-locality of Paulson's species. *S. inermis* (Paulson) will therefore in this paper be employed for material specifically identical with *S. elegans* (Calman).

Sicyonella inermis evidently differs considerably from *S. maldivensis* in that there is little sexual dimorphism

in degree of expansion of cornea, in length of antennular peduncle, and in slenderness of chela of third leg. These structures are in both sexes of *S. inermis* rather similar to the condition in females of *S. maldivensis* as described by Calman and by Hansen. Males of the two species are readily distinguishable (in addition to other characters, by the only slightly modified nature of the lower antennular flagellum in *S. inermis*); but what features may be diagnostic of the females is uncertain. According to Hansen's figure of *S. antennata*, the ratio between unciliated and ciliated portions of the external margin of the uropodal exopod in this third species of the genus amounts to only 4.6; by contrast, in *S. inermis* it ranges without sexual distinction between 6.5 and 7; and it is possible that there might also be a difference in this ratio between *S. maldivensis* and *S. inermis*, by which the females of these two forms could be distinguished. It is also possible that females of *Sicyonella* are distinguished in genital sculpture, which has not been previously described. The genital area in *S. inermis* is formed as follows :—

The sperm receptacles are a pair of large, shallow, broadly open pits situated just median to the bases of the third legs. In the available female each pit is filled to the brim with a roughly pyramidal spermatophore about 0.25 mm. in height and 0.38 mm. across the ventrally exposed face. This spermatophore, as in other Sergestids, includes the contents, but apparently not the envelope of the flask-shaped spermatophore found in the vas deferens of the male. The two receptacles are separated by a sternal bridge 0.20 mm. in breadth. The mouth of each pit is covered by a large semicircular flap (the coxal lamella), which projects inward from the inter-articular membrane of the third leg. From the posterior margin of the eleventh sternite there projects backwards a short, medially emarginate shelf, which does not extend quite to the anterior margins of the receptacles. Just behind the elevated posterior margin of the twelfth sternite, on the anterior part of the thirteenth, is a short median conical protuberance. Otherwise, the genital sternum presents no conspicuous landmarks. On the coxa of the third leg, just postero-lateral to its inner posterior

edge, is a short subrectangular projection, distal and lateral to which is a large crescentic depression in which lies the opening of the oviduct.

The female genitalia of *Sicyonella inermis*, as described above, are in sharp contrast to those of other Sergestinae. In *Sergestes*, as indicated by Burkenroad (6), the narrow openings of the deeply invaginated sperm-receptacles lie well anterior to the third legs, beneath the lateral parts of a transverse fold probably derived from the twelfth sternite (although it may possibly represent a projection of the eleventh sternite homologous with that in *Sicyonella*). From each receptacle a more or less well-defined channel runs back toward the postero-median margin of the base of the third leg. The coxal lamella only covers the posterior part of this channel. In *Acetes* the arrangements for sperm-storage are very similar to those in *Sergestes*, except that the transverse operculum is absent, and the openings of the receptacles lie more or less exposed near the anterior ends of the deep longitudinal channels. Kishinouye (7), in a valuable comparison of *Sergestes*, *Acetes*, and *Lucifer*, which was, unfortunately, not considered in my previous discussion of these genera, briefly describes the female genitalia, but it must be emphasized that while the apparatus for sperm-storage is not differentiated into channel and receptacle in *Sicyonella*, such a differentiation characterizes the forms considered by Kishinouye. The base of the third leg of the female of *Sicyonella* also differs from that of other Sergestinae, inasmuch as the projection at its proximo-median corner is, although superficially similar to the coxal nib of *Sergestes* and *Acetes*, not homologous with it. In these latter the coxal nib arises at the posterior lower corner of the aperture of the oviduct; whereas in *Sicyonella* the homologous projection is inconspicuous, and the one functionally equivalent to that of other Sergestinae is a production of the anterior margin of the oviducal opening.

Hansen (3), in discussing the differences between *Sicyonella* and *Sergestes*, has mentioned the occurrence of spines on the margins of the telson and the bifurcation of processus ventralis of the petasma as distinctive of the former genus. The first of these features may be observed to be common also to *Sergestes*, according

to Hansen himself (8) (although the usual number of such pairs of spines appears in *Sergestes* to be three, not four as in *Sicyonella inermis*). The second distinction, as formulated, is nullified by the unitary nature of the rudimentary processus ventralis of *Sicyonella inermis*, the petasma of which may be observed to resemble somewhat that of certain species of *Acetes*. *Sicyonella* seems to be distinguished from other Sergestinae, in features not considered by Hansen, by the form of the female genital apparatus, considered above, and by the absence of the arthrobranch of viii. and by the nature of the statolith, to be discussed in further paragraphs.

In the form of its walking legs, *Sicyonella* more nearly approaches the Penæidæ than do the other Sergestids, and it is very probably the primitive member of its family; but its resemblance to the peneid *Gennadas*, suggested by Milne-Edwards and Bouvier (9), is in most respects not appreciably greater than that of other Sergestidæ. Resemblances between spermatheca and spermatophore of Sergestidæ and *Gennadas* seem almost certainly to be a result of the convergent development of non-homologous structures (10); the geniculation of the antennal flagellum in both groups is less certainly a convergence, as also the presence in both of a well-developed ancecercite. In the separation between pars externa and pars media of the petasma, the Sergestidæ most nearly approach the series Aristææ of Penæidæ (rather than, as might be understood from the statement by Burkenroad, that of the Benthescymæ). A further interesting example of convergent resemblance to the Aristææ is provided by the reduction in both these peneids and in the Sergestidæ of the anterior members of the dorsalmost series of gills, the posteriormost dorsal gill remaining undiminished. This arrangement, however, affects the pleurobranches in the Penæid group, but the arthrobranches in the Sergestids, in which pleurobranches are completely absent. The lack of any pleurobranches in Sergestidæ is, although it has not previously been utilized, perhaps the most succinctly definable of the differences between this family and the Penæidæ.

Inasmuch as pleurobranches have been attributed to the Sergestidæ by all previous workers, the foregoing statement of their absence seems to require discussion. Two major

conceptions of branchial homology in the Sergestidæ have been proposed. According to the first of these, both the dorsal and the ventral series of gills behind somite viii. are pleurobranchs; whereas according to the second the major or ventral series is composed of arthrobranchs, the dorsal series only including pleurobranchs. Boas (11), since he overlooks the dorsal rudimentary gills of ix.-xii. and attributes the well-developed posterior dorsal gill of *Sergestes atlanticus* to xiv., avoids the difficulty in considering both dorsal and ventral gills as pleurobranchs into which Bate (12), Smith (13), and Hansen (8) fall—namely, that the pleurobranchs are in all other decapods present as an unpaired series. This difficulty seems sufficient to dispose of the first conception. Claus (14) regards the gills of the ventral series as arthrobranchs, but since he considers the posteriormost dorsal gill, attached at the posterior margin of somite xiii., as a pleurobranch, whereas pleurobranchs are universally attached to the anterior margins of their somites (6), it is evident that Claus's formulation is not acceptable. Kishinouye (15) has avoided Claus's difficulty by considering the posterior and preceding dorsal gills to be pleurobranchs attached to the anterior margins of xiv. and preceding somites, and has thereby produced an homologization of the gills which is logically acceptable. Somewhat as in the analogous case of the peneid *Eusicyonia* (6), however, an examination of the gills of *Sergestes* permits no other conclusion than that the dorsal series of gills are attached at the posterior margins of somites viii.-xiii., rather than at the anterior margins of ix.-xiv.—as, indeed, has been observed by the majority of workers. The dorsal gills must therefore be considered as posterior arthrobranchs rather than as pleurobranchs. This complete absence of pleurobranchs in Sergestidæ is paralleled by the process of suppression exhibited in Penæidæ, where the posterior podobranchs and pleurobranchs of Aristæinæ have disappeared in Eusicyoninæ, although the double series of arthrobranchs is largely maintained. It is rather surprising that Claus, who follows Boas in the correct attribution to the peneid *Eusicyonia* of a double series of arthrobranchs and no pleurobranchs behind ix., should in the same paper have attributed to *Sergestes*

uniserial arthrobranchs (such as have by many authors, following Bate, been incorrectly supposed to characterize *Eusicyonia*, the accurate formula for this genus given by Boas and by Claus having been overlooked by succeeding workers including myself (6)). For *Sicyonella* itself, Borradaile (16) with double incorrectness gives a branchial formula similar to the inaccurate one for *Eusicyonia* originated by Bate (17). Calman follows Smith in a description of the branchiæ more substantially correct, although still terminologically unacceptable. However, the rudimentary arthrobranch of viii. suspected by Calman to occur in *Sicyonella* is, I find, completely absent—in which feature the genus differs from the known species of *Sergestes*. The correct branchial formula of *Sicyonella inermis* is as follows:—

	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.
Pleurobranchs...	0	0	0	0	0	0	0	0
Arthrobranchs ..	0	0	1+r	1+r	1+r	1+r	2	0
Podobranchs ...	0	1	0	0	0	0	0	0
Epibranchs	1	1	0	0	0	0	0	0

An examination of the statocysts of the three available specimen of *Sicyonella inermis* reveals that the statolith is not a purely self-secreted cuticular pellet such as occurs in the other members of the family (18) but includes material introduced from the exterior*. The mouth of the statocyst is perhaps slightly more broadly open than is usual in *Sergestes*. In the Ceylonese specimen the statolith of each side is composed of three relatively large, irregular granules roughly of diameter 0.15 to 0.30 mm., lightly cemented together by cuticular material. Five of these grains are of what seems white shell- or coral-sand, while the sixth is of a black heavy substance with shining fractures. The white grains, which are destroyed with the evolution of gas on treatment with HCl, present angular and irregular surfaces, such as could hardly

* It has been observed by Shen (Proc. Zool. Soc. London, 1934, p. 539) that in common with the other Sergestidae *Sicyonella* possesses a statocyst; the difference in statolith, however, he appears to have overlooked.

be expected in autogenous concretions; while the fact that the granules are cemented together by cuticular secretion indicates that they could not have been accidentally introduced into the chamber during the capture of the shrimp. In the two individuals of *S. inermis* from the Red Sea sent to me by Dr. Ramadan, the statolith is composed of a much larger number (up to 20) of granules of much smaller size (average diameter, 0.07 mm.) than in the Ceylonese specimen. The majority of these granules are calcareous, but the presence among them of some siliceous particles affords critical evidence of the external origin of the mass. Dr. Ramadan further informs me that he has examined twelve specimens of *Sicyonella maldivensis* in the Cambridge Museum, and finds this species also to possess an exogenous statolith.

Among the Penæidæ, autogenous statoliths (similar to those of *Sergestes*) occur in the holonektonic groups both of Aristæinæ and Penæinæ; while the benthonic forms very closely related to these have statoliths composed of bottom débris (10). The occurrence of statoliths of external origin in *Sicyonella* in contradistinction to the remainder of the family to which it belongs is therefore paralleled among Penæidæ; but the implication that a representative of the otherwise nektonic Sergestidæ* must be of partially benthonic habit at the least is indeed surprising. *Sicyonella* has not been recorded from waters deeper than twenty fathoms, nor from more than a few miles from shore. Balss (4) indicates one of his specimens to have been taken in a surface-haul (and, indeed, he says "Die Form scheint eine . . . pelagische lebende Art zu sein"), but comparable catches are not infrequent

* See Kemp, Rec. Indian Mus. xiii. 2, 7, p. 44 (1917), for a statement of the mid-water habitat of the also neritic genus *Acetes*, in the American species of which at least the statolith is autogenous. According to Nakazawa, 1915 (after Gordon, Journ. Linn. Soc. London, Zool. xxxix. p. 313 (1935)), *Sergestes lucens* Hansen lives on bottom during the day where it feeds on constituents of the mud, at depths presumably in the neighbourhood of 100 fathoms; during the night it rises to mid-water or surface. This species is, however, perhaps similar in habit to the euphausiid *Meganyctiphanes norvegica* (Sars), a scarcely benthonic suspension feeder (Macdonald, Journ. Mar. Biol. Assoc. xiv. (3), p. 753 (1927)). In specimens of an apparently undescribed species of photophore-bearing *Sergestes*, nearly related to *S. lucens*, which were taken by day in the Gulf of Mexico swimming free of the bottom, although near it, at a depth of about 130 fathoms, the statolith is an autogenous concretion, as in the other species of *Sergestes*.

for similarly neretic species of *Penæus* or *Penæopsis*, which are bottom-living or even burrowing by day or through most of the lunar month. In any case, the term *benthonic* when applied to Decapoda Natantia, can refer at most to a vital dependence upon the bottom, rather than to an entirely substratal existence. An obligatory resort to bottom, such as that evidently required to obtain the statolith in *Sicyonella*, seems to bring the organism concerned within the range of the term, regardless of whether it may at times be found in nektic activity.

REFERENCES.

- (1) Journ. Linnean Soc. London, Zool. xxxii. 1913, p. 219.
- (2) Ann. & Mag. Nat. Hist. (8) xiii. 1914, p. 258.
- (3) 'Siboga' Exp. Mon. xxxviii. pp. 27, 29 (1919).
- (4) Exp. 'Pola'. . . . Zool. Ergbn. 30, Decapoda, pt. 1, Macura, in Wien. Denkschr. K. Akad. Wiss., Math.-Nat. Bd. 91, p. 14 (1915).
- (5) Mem. R. Com. Talaso. Ital. cc. p. 11 (1933).
- (6) Bull. American Mus. Nat. Hist. lxviii. 2, pp. 116 & 128 (1934).
- (7) Proc. Imp. Acad. Tokyo, iv. 3, p. 126 (1928).
- (8) Res. Camp. Sci. Monaco, lxiv. p. 16 (1922).
- (9) Bull. Mus. Comp. Zool. Harvard, xxvii. 3, p. 262 (1909).
- (10) See Burkenroad, Bull. Bingham Oc. Coll. v. 2, pp. 16, 22, & 128 (1936).
- (11) Mem. Acad. Roy. Copenhagen, (6) Sci. i. 2, p. 162 (1880).
- (12) Ann. & Mag. Nat. Hist. (5) viii. p. 193 (1881).
- (13) Bull. Mus. Comp. Zool. Harvard, x. 1, p. 96 (1882).
- (14) Arb. Zool. Inst. Wien, vi. p. 52 (1886).
- (15) Proc. Imp. Acad. Japan, iv. 8, p. 489 (1928).
- (16) Trans. Linn. Soc. London, Zool. xiii. p. 259 (1910).
- (17) Rept. Sci. Res. Voy. 'Challenger,' xxiv. p. 293 (1888).
- (18) Hanström, Zool. Jahrb., Anat. Ont. lvi. 3/4, p. 477 (1933).

L.—*Preliminary Note on Four new Rodents from Korab Mountains.* By V. and E. MARTINO.

THE material on which this note is based was collected between July 12 and August 24, 1935. Though the collecting of small mammals during the summer months in Macedonia is very difficult, nevertheless we had the luck to catch eleven species of the rodents, four of which must be described as new. The collecting trip was assisted financially by the Trustees of the British Museum, and successfully accomplished, thanks to the co-operation of Mr. M. A. C. Hinton and Mr. J. L. Chaworth-Musters.

Dolomys grebenščikovi korabensis, subsp. nov.

Type.—Collector's no. 48-35 (B.M. no. 1937.3.22.1), ♀, collected by E. Martino, 25 July, 1935.

Type-locality.—Velika Korabska Vrata, Korab Mts., Jugoslavia. Alt. 1900 m.

Characters.—Colour of upper parts in adults bluish grey, without visible brownish tinge. Hind foot less than 24 mm. (22.5-23.5 instead of 25 mm. in *Dolomys bogdanovi*). Postorbital squamosal crests clearly developed only in adult age, and therefore the brain-case of young specimens is more or less rounded. The Korabian young specimens differ from young specimens of *D. grebenščikovi* from Bistra by the more simple building of the anterior loop of m_1 ; the fifth pair of salient angles either absent or weakly developed. In adult age the first loop of m_1 attains a simple heart-like form.

Systematic Remarks.—The *Dolomys* from Korab Mountains is quite clearly distinguishable at all ages from *Dolomys bogdanovi bogdanovi* Martino and *D. b. marakovići* Bolkay, but young Korabian specimens are similar to the young type-specimen from Bistra. However, the true relation of our new form to *D. grebenščikovi* cannot be established definitively until a series of adult specimens from Bistra is examined. Perhaps the form of m_1 in the type-specimen *D. grebenščikovi* is only an extreme variation, which has not yet been found on the Korab Mountains.

Measurements.—Type and average of four adult paratypes in parentheses:—Head and body 134.0 (129.2); tail 88.0 (89.2); hind foot 23.0 (23.2); ear 17.0 (17.2). Cranial measurements: condylo-basal length 33.2 (32.6); zygomatic breadth 19.5 (18.6); interorbital constriction 4.8 (4.5); occipital breadth 15.4 (14.8); nasal length 10.0 (9.4); diastema 10.6 (10.5); upper molars 8.0 (8.0); mandible 21.5 (20.7); lower molars 7.5 (7.2).

Specimens examined.—Type and nine paratypes: collector's nos. 64-35; 66-35; 81-35; 82-35; 83-35; 84-35; 85-35; Original nos. 953 and 954.

Field-notes.—This vole lives in the cracks of the small limestone rocks amongst the steppe flora (*Stipa*, *Festuca*, etc.). Alt. 1800-2000 m.

Arvicola terrestris korubensis, subsp. nov.

Type.—Collector's no. 71–35 (B.M. no. 1937.3.22.3), ♂, collected by E. Martino, 4 August, 1935.

Type-locality.—Čos-Alija, Korab Mountains, Jugoslavia. Alt. 1500 m.

Characters.—Colour of upper parts very similar to *A. t. illyricus*, and underparts always with noticeably whitish tinge, but size smaller. Condyllo-basal length 35–38 mm. (instead of 38–40 in *A. t. illyricus*), and hind foot 25–28.5 mm. (instead of 28–32 in last subspecies).

Measurements.—Type and average of six adult paratypes in parentheses:—Head and body 166.0 (155.0); tail 97.0 (94.2); hind foot 27.5 (26.2); ear 15.0 (13.6). Cranial measurements: condyllo-basal length 37.8 (35.4); zygomatic breadth 23.1 (21.6); interorbital constriction 4.9 (4.8); occipital breadth 17.4 (16.1); condyle to m^3 14.6 (13.3); condyle to bulla 10.5 (10.3); nasal length 10.0 (9.5); diastema 12.6 (11.5); upper molars 9.5 (8.9); mandible 24.5 (22.8); lower molars 9.5 (8.9). (The type is a very large and old specimen.)

Specimens examined.—Type and six adult paratypes: nos. 62–35; 70–35; 72–35; 112–35; 115–35; and Original no. 955.

Field-notes.—The new subspecies dwells on the mountain swampy meadows along the upper tributary streams of the Radika River. These meadows are formed only on the impermeable siliceous deposits.

Pitymys mustersi, sp. n.

Type.—Collector's no. 57–35 (B.M. no. 1937.3.22.9), ♀, collected by E. Martino, 31 July, 1935.

Type-locality.—Štirovica, Korab Mountains, Jugoslavia. Alt. 1300 m.

Characters.—Size small: condyllo-basal length less than 23 mm., hind foot less than 15 mm. Lateral extremities of interparietal bone in contact with temporals. Third upper molar short, no longer than the second one, but its inner side usually with three re-entrant angles; first outer triangle of m^3 as large as the second one, but so broadly communicating with the inner triangle that both triangles together form a single transverse loop.

Measurements.—Type :—Head and body 86.0; tail 28.0; hind foot 14.5; ear 8.8. Cranial measurements: condylo-basal length 22.4; zygomatic breadth 13.6; interorbital constriction 3.6; occipital breadth 10.7; condyle to m³ 9.2; condyle to bulla 7.2; nasal length 6.1; diastema 6.6; upper molars 5.3; mandible 13.8; lower molars 5.2.

Specimens examined.—Type and three paratypes: collector's nos. 60–35 and 86–35, and Original no. 959.

Field-notes.—Only four specimens were found, all on the small forest meadows between 1300–1500 mm.

Sylvæmus sylvaticus stankovići, subsp. nov.

Type.—Collector's no. 39–35 (B.M. no. 1937.3.22.10), ♂, collected by V. & E. Martino, 20 July, 1935.

Type-locality.—Guri Velpnis, Korab Mountains, Jugoslavia.

Characters.—General colour yellowish buff similar to *S. s. dichrurus*. Size between the last-named subspecies and true *S. s. sylvaticus*. Tail very long, nearly 103 per cent. of the length of head and body instead of 91 per cent. in true *S. s. dichrurus*.

Systematic Remarks.—The tail in *S. s. dichrurus* from type-locality (Sicily) is shorter than head and body (91 per cent.). Therefore we accept the pale Macedonian lowland forms with short tail (90 per cent.) as corresponding to true *S. s. dichrurus*, but the Korabian Mountain pale form may be described as new.

The relations between the lowland and mountain forms are as follows :—

Length of the tail in per cent. of the head and body.

	83.	84.	85.	91.	92.	93.	96.	97.	98.	100.	103.	104.	107.	112.
<i>S. s. stankovići</i> , Korab Mountains.	♀	♂	♂	♂	♂	♀	♀
	♀	♀	♂	♂	♂	♂	
	♀	♀	♂	♂		
	♂	♂	♂			
<i>S. s. dichrurus</i> , lowlands of Macedonia.	♂	♀	♂	♂	♀	♂	♀	♂	♀					
	♂	♂	♂	♂					
	♂													

In Bosnia and wooded mountain portion of Serbia (Kopaonik) also lives a long-tailed subspecies of *S. sylvaticus*, but it is large and rich-coloured like *S. s. callipides* Cabrera,

Measurements.—Type :—Head and body 95 ; tail 97.0 ; hind foot 21.5 (average of twenty paratypes 22.0). Cranial measurements : condylo-basal length 23.8 (average of twenty paratypes 23.6) ; interorbital constriction 4.5 ; condyle to m^3 11.0 ; condyle to bulla 7.2 ; nasal length 10.0 ; diastema 7.7 ; upper molars 4.0 ; mandible 14.7 ; lower molars 4.0.

Specimens examined.—Type and twenty paratypes : collector's nos. 56-35 ; 68-35 ; 69-35 ; 58-35 ; 59-35 ; 42-35 ; 43-35 ; 78-35 ; 91-35 ; 94-35 ; 99-35 ; 101-35 ; 102-35 ; 103-35 ; 108-35 ; 114-35 ; 121-35 ; 122-35. Original nos. 963 and 964.

Field-notes.—The habitat of this subspecies is among the densely interlaced trunks of low *Cytisus* shrub, at an altitude of 1300-1700 m.

LI.—*Tropical Species of Tropidopola St. and the Past History of the Genus (Orthoptera, Acrididæ).* By B. P. UVAROV, D.Sc., British Museum (Natural History).

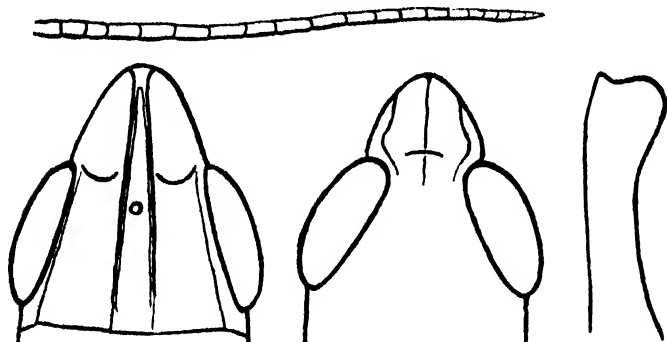
IN my revision of the Palearctic species of the genus *Tropidopola* ('Eos,' ii. 1926, pp. 149-177) I have expressed an opinion that they should be regarded as relics of the age when savanna conditions extended as far as northern shores of the Mediterranean Sea and Central Asia. This conclusion was based entirely on the isolated position of *Tropidopola* amongst purely Palearctic genera, and on its obvious taxonomic affinity to a compact group of genera occurring in African savannas and in the respective climatic zone of India ; it was further supported by the peculiar general shape of body and by various structural features which are highly typical of Acrididæ living in tall dense grass. My interpretation of the history of the genus was, of course, open to the objection that no species of *Tropidopola* were known from Africa or India. I am very pleased, therefore, to be able to report that I have now before me two new members of the genus, one from each of those two countries. This discovery supplies a definite proof of the savanna origin of *Tropidopola*, but this should not be taken to imply that I am necessarily inclined to regard savanna fauna as having

developed in the past where it is found at present. Indeed, it would be at least equally justifiable to suggest a more northern origin of the savanna biocenosis, with a subsequent southward shifting of the whole zone. In favour of this view is the fact that *Tropidopola* represents certainly the least specialized (*i. e.*, more primitive) member of its group as compared with the genera like *Ischnacrida*. However, this problem cannot be discussed here in all detail, and I hope to return to it elsewhere. At present, I would only like to stress the view that the Mediterranean and the Eremian faunas include a number of forms which represent relics of a savanna fauna.

The descriptions of the two new forms, the types of which are in the British Museum, are as follows :—

Tropidopola nigerica, sp. n. (See figure.)

♂.—Antennæ twice as long as the head, round; all joints longer than broad; those in the middle about three times as long as broad.



Tropidopola nigerica, sp. n., ♂; antenna, head from the front and from above, cercus.

Frontal ridge deeply sulcate, distinctly and gradually narrowed towards the fastigium. Fastigium of vertex about as long as broad; apex parabolic; disc with the sides distinctly incurved. surface weakly impressed; margins raised; median carina weak, irregular; transverse sulcus practically straight; foveolæ reaching beyond the middle of the margin, irregular.

Cercus widened apically ; lower angle attenuate, short and subacute ; upper angle expanded, rounded.

♀.—Antennæ half again as long as head, somewhat compressed, narrowing both basally and apically ; middle joints about twice as long as broad. Frontal ridge deeply sulcate, a little more suddenly narrowed at the fastigium than in the male. Fastigium of vertex slightly broader than long.

Upper valvæ of the ovipositor with 4–5 lateral teeth, and an irregular median row of minute black granules, separated by a submarginal furrow. Lower valvæ with 4 subapical, 5–6 lateral, and about 12 median teeth.

Total length, ♂ 34, ♀ 42.5 ; pronotum, ♂ 5, ♀ 7 ; elytra, ♂ 24, ♀ 29 ; hind femur, ♂ 12.5, ♀ 17 mm.

FRENCH SUDAN : Middle Niger, Sarafere, vii. 1932, 1 ♂ ; Dire Hemgu, viii. 1932, 2 ♂♂ (including the type), 3 ♀♀ (*O. D. Lean*).

This species appears to be nearest to *T. cylindrica cylindrica* (Marsch.) known from Southern Spain, Sicily, Sardinia, Algeria, and Tunis, but has much longer antennæ and fastigium of vertex. The female differs also by much more developed series of median teeth on the lower valvæ of the ovipositor.

Tropidopola longicornis indica, subsp. n.

♂.—A little larger in size than the typical subspecies of Egypt, differing from it also in the following characters : frontal ridge with the margins straight and the sulcus reaching quite to the apex ; fastigium of vertex parabolic, shorter than in the typical subspecies, and more rounded apically ; antennæ even longer than in subspecies *longicornis*, about twice and a half as long as the head.

INDIA : Pusa, Bihar, 17. vii. 1915, at lamp, 1 ♂, type (*Fletcher*) ; Kaira, Bombay, 28. xi. 1903, 1 ♂.

I have before me also a female *Tropidopola* from Madras, which may be referred to this subspecies, but I refrain from doing so until more material can be studied. There is also a male from Pharisamer Hills, Rena State, which belongs to a distinct species (small, with relatively shorter elytra and little expanded cerci), but its head is damaged and it has to be left undescribed. This shows, however, that there is more than one species of *Tropidopola* in India, and that the range of the genus extends into Southern India as well.

SUPPLEMENT TO THE REVISION OF THE GENUS.

Since publishing my revision in 1926 (*l. c.*), I have described the following two subspecies :—

Tropidopola turanica caspica Uv. North-Western Iran
(Trav. Inst. Zool. Acad. Sci. Leningrad, i. 1933,
p. 225).

Tropidopola cylindrica iranica Uv. South-Eastern Iran
(*l. c.* p. 226).

Opomula syrica Walker, 1871, considered by me a synonym of *Tropidopola longicornis longicornis*, has been described from two specimens collected by B. Lowne at the Dead Sea. These two types must have been lost, but I find in the Oxford Museum collection one male and two females labelled "Dead Sea. B. Lowne coll. 1863-64," which obviously belong to the same series as the lost types of *O. syrica*. Their examination enables me to confirm the above synonymy.

T. longicornis longicornis is now known to occur on the White Nile as far south as lat. 6° 45' N., whence I have seen specimens in the Oxford Museum.

LII.—Tylidæ (Micropezidæ, Diptera) aus der Sammlung des British Museum of Natural History. Nachträge zur "Revision der Tyliden.—II." Von WILLI HENNIG, Leipzig.

Aus der Sammlung des British Museum übersandte mir Herr Dr. John Smart in liebenswürdiger Weise eine Reihe von Tyliden, die mir bei Abfassung meiner Revision dieser Familie (Stett. Ent. Zeit. xcv. und xevi. 1934 und 1935; 'Konowia,' xiv. und xv. 1935 und 1936) noch nicht vorgelegen hatten, aber einige interessante Ergänzungen zulassen. Eine Reihe solcher Ergänzungen ist im Druck bei der Stett. Ent. Zeit. ("Nachträge zur Revision der Tyliden.—I."), weitere sind nachstehend aufgeführt.

1. *Pæcilotylus pictus*, sp. n. In meiner Tabelle der Arten von *Pæcilotylus* ("*Pæcilomyia*") in Stett. Ent. Zeit. xcv. p. 97 kommt man zum Gegensatz 20 (21),
Ann. & Mag. N. Hist. Ser. 10. Vol. xix. 34

bei dem eine Entscheidung unmöglich wird, da die vorliegende Art weder schwarzen noch gelbroten Thorax besitzt. Stirn, Scheitel und Hinterkopf dunkelbraun, glänzend. Stirnstrieme ("Mesofrons") samtschwarz. Quer durch diese Stirnstrieme zieht in Höhe der Ozellen ein silberweiser Tomentstreifen, pvt., vte., vti., orsa. ("vordere vti." in meiner Revision) und 2 orsa. ("Frontalborsten"; über die Homologie dieser Borsten bei den Tyliden habe ich mich in meiner Bearbeitung der Tanypeziden in "Lindner, Die Fliegen der paläarktischen Region, Teil 44" ausgesprochen) vorhanden. Untergesicht dunkel. Wangen, Backen gelblich, ebenso wie die unteren hinteren Augenränder silberweiss bestäubt. Prälabrum ("Clipeus" in meiner Revision der Tyliden) und Mundteile gelb. 1. und 2. Fühlerglied dunkel rostbraun, 3. Glied fehlt. Thoraxrücken dunkel rostbraun, mit 2 breiten Längsstreifen gelblichen Tomentes, die den Vorderrand nicht ganz erreichen. 1 dc. vorhanden. Das sogenannte "Metanotum" rostbraun wie der Thoraxrücken. Pleuren gelb mit 2 braunen Schrägstreifen: Der eine zieht von der Notopleura (diese selbst nicht ganz erreichend) nach der mittleren, der 2. von der Flügelwurzel nach der hinteren Coxa. Die gelben Teile der Pleuren, besonders der Zwischenraum zwischen den beiden braunen Schrägstreifen mit silbernem, wenig gelblichen Toment. Der Haarschirm der Sternopleura auffällig, gelb. Halteren gelb. Abdomen gelb, vermutlich rostbraun wie der Thoraxrücken und vielleicht teilweise mit gelben Zeichnungen. Coxa und Femur der Vorderbeine gelb, die Coxa silbern bestäubt. Vordertibia schwarz, Spitze auf der Innenseite und der gesamte Tarsus weiss, nur das letzte Tarsenglied an der Spitze ein wenig gebräunt. Mittel- und Hinterbeine fehlen. Ein aufgeklebtes Beinpaar (wahrscheinlich Hinterbeine) hat gelbe Femora mit ziemlich breitem aber unscharf begrenztem Proximomedianring und schwarzer Spitze. Tibia schwarz. Flügel ziemlich hyalin, mit einer auffällig winkelförmigen medianen braunen Querbinde, deren Spitze nach der Flügelbasis zu gerichtet ist. Zwischen dieser Querbinde und einer allerdings nur sehr schwachen Spitzenbräunung ein hyaliner Zwischenraum, der die Form der medianen Querbinde genau nachahmt. Trotz der ziemlich schlechten Erhaltung des Typus scheinen

mir die Merkmale charakteristisch genug, um eine Beschreibung zu rechtfertigen.

Flügelänge 12 mm.

Bolivia, Yungas de la Paz, 1000 m., Brit. Mus. (Nat. Hist.). Ein Exemplar ohne unterleib.

2. *Grallipeza obscura* Hennig (Stett. Ent. Zeit. xcv. p. 300) zu dieser bisher nur aus Bolivien bekannten Art gehören offenbar 2 in Kopula gefangene Exemplare des Brit. Mus. (Nat. Hist.) (Brit. Guiana, Essequibo Riv., Moraballi Creek, Oxford Univ. Exped.). Sie stimmen mit der Beschreibung überein, doch ist am Vordertarsus Glied 2 ganz und auch die Basalhälfte des 3. Gliedes weiss. Eine Spitzenbräunung des Flügels und eine Verbindung zwischen dieser und der medianen Querbinde ist kaum angedeutet. Vielleicht sind dies konstante Unterschiede der guayanischen gegenüber den bolivianischen Tieren?

3. *Ptilosphen rufifrons* Enderl. (l. c. p. 317). Bisher nur von Panama und Columbien bekannt, im Brit. Mus. (Nat. Hist.), von N. Ecuador.

4. *Plocoscelus schildi* Cresson (l. c. xevi. p. 47). Bisher nur von Costa Rica bekannt, im Brit. Mus. (Nat. Hist.), von British Guiana (Upper Courantyne R., King Frederick William IV. Falls).

5. *Erythromyiella rufa* Hennig ('Konowia,' xiv. p. 69). Bekannt von Uganda Prot. und Liberia, im Brit. Mus. (Nat. Hist.), von Natal: Kloof, 1500 ft.

6. *Cephalosphen clavaticlunis* Enderl. (l. c. p. 76). 1 ♂ des Brit. Mus. (Nat. Hist.) von S. Nigeria, Oshogbo. hat völlig zeichnungslose Flügel, die gleichmässig nur schwach bräunlich getrübt sind. Ausserdem ist bei ihm auch das 2. Glied der Vordertarsen weiss. Ich glaube trotzdem, dass es zu Enderlein's Art gehört. Bei der Beschreibung der Gattung (l. c. p. 75) ist übrigens der Hinweis auf Abb. 4 zu streichen.

7. *Metopochetus bivittata* Macquart (l. c. p. 297). Im Brit. Mus. (Nat. Hist.) viele Exemplare von S.E. Queensland, Tambourine Mts.

LIII.—*Mammals collected by the Lake Rudolf Rift Valley Expedition, 1934.* By JANE ST. LEGER, F.Z.S. From the Department of Zoology, British Museum of Natural History.

ALTHOUGH the chief object of the Lake Rudolf Rift Valley Expedition was to make a geological survey and report on this region, a small and interesting collection of mammals was obtained and presented to the British Museum. The majority of the specimens were collected by Dr. W. S. Dyson, the acting medical officer of the Expedition, and by Mr. D. G. MacInnes, who accompanied the party as palæontologist.

The country is for the main part sand and gravelly sub-desert, with patches of rock and stony hills. Acacias and dom palms occur in the vegetation of the river valleys. The only forest is confined to a high altitude on the mountains, but from these no specimens were obtained. The Lake Rudolf Basin is cut off from Uganda by an escarpment 1500 feet in height, and the maximum rainfall east of this escarpment is 5"-10", as opposed to the (estimated) rainfall of 25"-30" of the Uganda plateau. This escarpment, together with the difference in the amount of rainfall, appears to form an insurmountable barrier for the majority of species. Exceptions are the bats and a tree-squirrel, described below, which ranges, probably along the river valleys, as far west as the Nakwai Hills.

The fauna of the Lake Rudolf region, as was indicated by the collection obtained by the previous expedition in 1930-31, proves to be nearly related to that of Somaliland and the plains of Northern Kenya and South Abyssinia.

Localities from which specimens were obtained are :—

Lodwar.—About 40 miles above the mouth of the Turkwell River.

Lopi River.—About 10 miles north of Turkwell River.

Kaitherin.—Hills about 40 miles west of north end of Lake Rudolf.

Komogin River.—About 15 miles south of north end of Lake Rudolf.

Ferguson's Gulf.—About 30 miles north of Turkwell River.

Koliokwell River.—Running into Ferguson's Gulf,

Cercopithecus æthiops arenarius Heller.

♀. 1 (juv.). Lodwar.

This pale-coloured race was described from a specimen obtained at Merille water-holes, Marsabit Road, and appears to be the form of the arid localities of Northern Kenya. It is much paler in colour than *centralis* of Uganda, whilst from *callidus* of Lake Naivasha and adjoining localities it is distinguished by its shorter fur, rather longer tail, and lighter colouring.

Lavia frons Geoffroy.

♂. 7. Lopi River.

The Uganda-Lake Rudolf Basin escarpment forms no barrier to this bat, which extends westward as far as Senegal.

Cardioma cor Peters.

♂. 8, 9; ♀. 10. Lodwar.

1 ♂, 3 ♀. Lodwar. In alcohol.

This bat apparently occurs only in the region east of the escarpment.

Nycteris hispida Schreber.

♂. 11. Lodwar.

1 ♂, 1 ♀, Lodwar. In alcohol.

This species ranges westward across the escarpment to Senegal.

Liponycteris nudiventris Cretzschmar.

♂. 12; ♀. 13. Lodwar.

♂. 14. Kaitherin.

This bat has been recorded as far west as Northern Nigeria and Gambia.

Scoteinus schlieffeni Peters.

♀. 15. Lodwar.

1 ♂. Lodwar. In alcohol.

Elephantulus rufescens delicatus Dollman.

♀. 16. Lodwar.

1 ♂, 2 immature ♀, Lodwar. In alcohol.

The colour of this skin is slightly paler than that of the type and only other specimen, from Orr Valley,

south-east of Lake Rudolf. The hair of the underside is pure white to the base.

Ethechinus sclateri Anderson.

♂. 19. Lodwar.

This species has only been recorded hitherto from British Somaliland, and is evidently the hedgehog of the arid regions which extend from Somaliland through South Abyssinia to Lake Rudolf. In this skin from Lodwar the dorsal colour is slightly darker than that of the four dried skins in the British Museum from British Somaliland, owing to the comparatively narrower white tips to the spines, so that the general effect is speckled brown rather than "white with an orange-brown tint" of the description of *sclateri*; on the underside there is little trace of the patches of brown colouring of three of the skins from British Somaliland; in the fourth Somaliland skin (a juv.) the underside is pure white. Colouring of hedgehogs varies so much individually as to be of little racial value.

Genetta genetta neumanni Matschie.

♂. 2 & 3. Lodwar.

This form has a wide range throughout the less thickly forested regions of East Africa from the borders of the Congo Forest to the coast.

Myonax sanguineus rendilis Lönnberg.

♂. 3 a. Lodwar.

The type-locality of this race is the north bank of the North Guaso Nyiro River, below Chanler Falls. It is rather paler in colour, with slightly smaller hind foot (57 mm.) than *ibexæ* of the forested area of Mt. Kenya.

Helogale percivali Thomas.

♂. 4 ; ♀. 5. Kaitherin, East.

♂. 6. Lodwar.

This species is distinguished by the unusual colouring of rufous head and black or dark brown, instead of reddish, feet. It has been obtained from localities

near the Turkwell River, but has not before been recorded as far north as Mt. Kaitherin district.

Heliosciurus multicolor dysoni, subsp. n.

♀. 17 & 18. Lodwar.

Closely related to *elegans* of Mt. Elgon, but with dorsal colour paler and the ochraceous colouring of head, arms, and feet replaced by pale yellow.

Colour of upper surface grizzled grey, lightly tinged pale buff; under surface pure white, without the buffy tinge generally present in *elegans*; cheeks and crown of head strongly washed pale yellow. A wide white eye-ring. Arms, hands, and feet (of type) suffused pale yellow; in the topotype the colour of the arms, hands, and feet is paler, greyish white washed yellow. Tail ringed black and pale buff, brighter buff on the under than on the upper surface, the tip of the hairs pure white. Skull smaller with rather less inflated bullæ than in *elegans*.

Type.—Adult female, collected by D. G. MacInnes, 22nd February, 1936, at Lodwar, about 40 miles from the mouth of the Turkwell River, Lake Rudolf (B.M. no. 36.11.4.19).

Measurements.—Hind foot (from dried skin) 46.5 mm.

Skull.—Greatest length 47; condylo-basal length 42.4; zygomatic breadth 26.4; breadth of brain-case 20.2; length of upper cheek-tooth series 9.0.

From its nearest neighbour, *omensis* of the Omo River, *dysoni* is immediately distinguished by its paler, less brown, colour and buffy suffusion of limbs and feet; from *madagæ* of Uma, 50 miles north of Nimule, by its pure white, instead of buffy underside; and from *lateris*, of Lado, by its much paler grey colour and buffy suffusion of limbs and feet.

Specimens in the British Museum from Wei-wei (We-we) River, Mt. Maroto, Nakwai Hills, and from Abu Ramba, Dinder River, appear to be referable to this race. The paler colour is evidently not due to bleaching. The above series, with the possible exception of the skin from Dinder River, which is undated, were collected in January and February, whilst the type and a series of *elegans* from Mt. Elgon and the upper reaches of the Kerio and Turkwell Rivers were all collected in the same period, January and February.

This squirrel has been named in memory of Dr. W. S. Dyson, who tragically lost his life on this Expedition.

Xerus rutilus dabagalla Heuglin.

♂. 20. Komogin River.

♂. 23 ; ♀. 21. Lodwar.

♀. 22. Kaitherin, East.

In two skins the tails are ringed very dark brown and white, in the third skin only the distal two-thirds of the tail is so coloured, the proximal portion being pale brown and white ; in the fourth skin the whole of the tail is pale brown and white, except for the extreme tip, where there is one ring of dark brown. All these skins were collected between 8th March and 2nd April.

In the series of skins of *dabagalla* in the British Museum, all from British Somaliland, the tails are all pale brown and white in colour. This series was collected in the months of August to November.

This variation in tail-colour is evidently due to bleaching of the old pelage during summer and its renewal in the early spring. The bleaching of the tail is not so strongly marked in skins of species inhabiting less arid regions, and it is very little noticeable in skins of *dorsalis* of Baringo or *saturatus* of the southern East Coast regions, whilst it is strongly marked in *stephanicus* of the district between Lake Rudolf and Lake Stephanie. In two skins from Lake Stephanie, both collected on 18th August, the tail of the first specimen is dark brown ringed white, whilst that of the second is pale brown-white, and is indistinguishable in this respect from that of *dabagalla* of Somaliland, from which *stephanicus* is distinguished, however, by its slightly larger size.

The skins of Lake Rudolf are immediately distinguished from *dorsalis* of Baringo by the less dark dorsal colouring, and from *rufifrons* of Northern Guaso Nyiro River by the red colouring of the head being confined to the forehead, not extending to the crown as in *rufifrons*.

Taterona vicina iconica Dollman.

♀. 24. Lodwar.

This is a rather pale-coloured skin, but appears

indistinguishable from the series from the type-locality of *iconica*, the Northern Guaso Nyiro River.

Taterillus lowei Dollman.

♂. 26 & 27. Lodwar. 3 immature ♀, Lodwar. In alcohol.

The type-locality of this pale-coloured form is 10 miles west of Ngamatak Hills, a few miles south of Lodwar.

Gerbillus cosensi Dollman.

♂. 4 specimens ; ♀. 3 specimens. Lodwar.

♂. 35. Lake Rudolf.

♂. 3 specimens. Koliokwell River.

♀. 38. Ferguson's Gulf.

2 ♂, 3 ♀. Lodwar. In alcohol.

The type-locality of *cosensi* is Kozihiri (Koziberi) River only about 25 miles south of Lodwar. The type (and only other specimen) is juvenile, but, allowing for the difference in age, this series from Lake Rudolf appears indistinguishable from it.

Grammomys macmillani Wroughton.

♂. 39 ; ♀. 40. Lodwar.

These are the first specimens received by the British Museum since the type-specimen was obtained in 1905 by Mr. Butler at Wouida, north of Lake Rudolf. These two skins show the strong buffy dorsal tinge characteristic of this form, and in the skull the anterior zygomatic plate is narrow and runs vertically downwards as in the type. From its nearest neighbour, *surdaster lutosus*, of Mt. Nyiro, *macmillani* is immediately distinguished by its much smaller size.

Lepus raineyi Heller.

♂. 40. Komogin River.

This skin agrees with the description of *raineyi* from Longaya Water, 30 miles south of Mt. Marsabit, in its light grey colouring and pale buffy feet with fulvous-coloured pads.

Procavia (Heterohyrax) brucei Gray.

- ♀. 41. Kaitherin.
 ♀. 42. Lake Rudolf.

POSTSCRIPT BY R. W. HAYMAN (Department of Zoology,
 British Museum of Natural History).

Some further specimens collected by the Lake Rudolf Rift Valley Expedition have come to hand since the author left England for a period of some months. At her request I have examined this material. It includes a new race of mouse-tailed bat (*Rhinopoma*), which Miss St. Leger asks me to describe, and a shrew and a spiny mouse not represented in the collection first received :—

Rhinopoma cystops macinnesi, subsp. n.

A dwarfed form of the well-known species of Egypt and the Sudan, having a shorter forearm and a much lighter and smaller skull.

Type.—Brit. Mus. no. 36.11.4.45. Adult male in alcohol, collected on Bat Island, near Central Island, Lake Rudolf, April 24th, 1934. Another male and a female examined were taken at the same time and place.

Description of Type.—Externally similar to true *cystops*, but having a forearm measurement of only 46 mm. (47 mm. in the other two specimens). In adult *cystops* the forearm averages 52, sometimes reaching 55. The colour of the fur is similar to that of the typical form, a pale plumbeous-fawn, paler at the base.

The skull is notably smaller and weaker than that of *cystops*; the sagittal crest is very weak, being barely indicated, while in *cystops* it is strongly developed in both sexes. The rostrum is narrower, the bullæ smaller, and the reduction in the size of the teeth is illustrated by the breadth of m^2 in *macinnesi* being 1.8, while in the type and another specimen of adult *cystops* the figures are 2.2 and 2.3 respectively. Compared with the skulls of *Rhinopoma pusillum* Thos., from Persia, and *muscatellum* Thos., from Muscat, two species of approximately similar external dimensions, the skull of this new form is quite distinct, being smaller and narrower, with smaller teeth. In the following table the measurements of three specimens of *macinnesi* are compared with those of the types of *cystops*, *pusillum*, and *muscatellum* :—

	Head and body.	Tail.	Hind foot.	Ear.	Forearm.	Skull.					
						Greatest length.	Zygomatic breadth.	Maxillary breadth.	Length of bulla.	Upper tooth-row (C-M ²).	Breadth of M ² .
Type <i>macinnesi</i> ..	50	56	10	17	46	15.9	8.5	6.7	3.8	5.2	1.8
Paratype <i>macinnesi</i>	52	60	9	16	47	15.7	8.7	6.5	4.1	5.2	1.8
Paratype <i>macinnesi</i>	48	57	9	16	47	..	..	..	..	..	..
Type <i>cystops</i>	53	59	11.5	17	53	16.7	10	7.7	4.5	5.6	2.2
„ <i>muscatellum</i> ..	53	60	..	17.5	49	16	9.5	7.3	4.7	5.3	2
„ <i>pusillum</i> ...	54	46	11.3	17.5	47	15.5	9.2	7	4.4	5.3	2.1

This discovery extends the known range of the genus into Uganda, and I have pleasure in associating with it the name of Mr. D. G. MacInnes, to whom much of the success of the mammal-collecting was due.

Crocidura somalica Thos.

1 ♀ in alcohol. Kakuma, district 50-60 miles north-west of Lodwar.

Acomys wilsoni enid St. Leger.

1 ♂ in alcohol. Lorogumu, south-west of Lodwar.

2 ♂ immature, in alcohol—one from Kakuma, one from Noyang.

The adult from Lorogumu agrees well with the type of this form, but the two younger specimens are darker.

LIV.—On Two new Polychætes from the Indian Ocean.

By C. C. A. MONRO, Department of Zoology, British Museum (Natural History).

PROFESSOR G. GATES recently submitted to me a small collection of Polychæta from Maungmagan on the Burmese coast. This contained examples of a new species of Nereid *Ceratonereis burmensis*, sp. n., and of

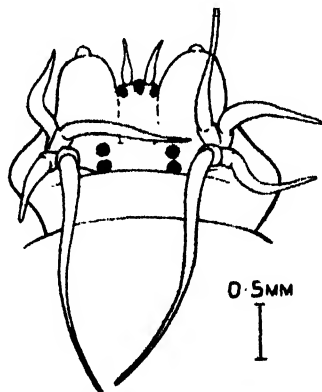
a new genus of Capitellid *Parheteromastus tenuis*, gen. et sp. n. As regards the new Nereid, I had already early in 1936 received from Mr. S. H. Prater, of the Bombay Natural History Society, some heteronereids taken off Bombay. These I believe to be the epitocous form of the new species from Maungmagan.

Ceratonereis burmensis, sp. n.

Occurrence.—Maungmagan, Burma, *G. Gates*, several atocous; off Bombay, *S. H. Prater*, several epitocous.

Description.—In the atocous stage the colour in spirit is grey-green, with a black median dorsal stripe over about the first ten chætigers and traces of black transverse segmental bands. Black pedal glands are conspicuous throughout the body. The largest specimen measures 45 mm. by 2 mm. without the feet for about 110 chætigers. The prostomium (fig. 1 *a*) is not incised and the

Fig. 1 *a*.

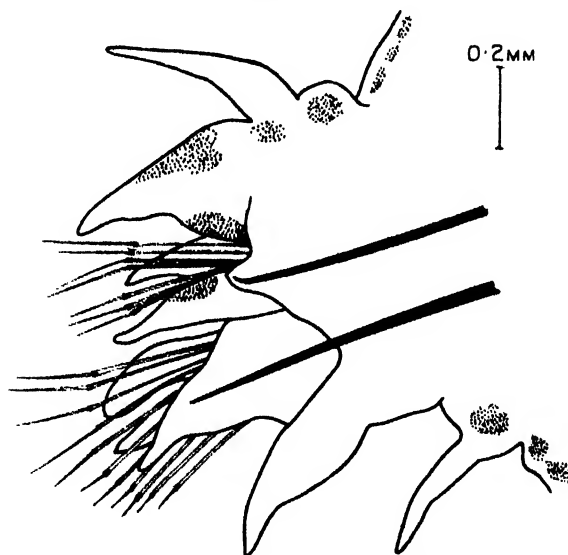


Ceratonereis burmensis, sp. n. Head from above.

tentacles are about one-third the length of the head. The palphophores are rather short and flattened, and have small button-like palps. There are two pairs of small eyes in a rectangle and three small patches of black pigment just behind the bases of the tentacles. The hinder tentacular cirrus of the inner pair reaches back to the sixth chætiger, and the remainder are less than half this. The buccal segment is about $1\frac{1}{2}$ times as long

as the first chætiger. The jaws are delicate, transparent, and finely denticulated. There are no paragnaths on the proximal ring. The paragnaths of the distal ring are variable. Group i. has a more or less rectangular patch of very small paragnaths; ii. has a narrow oblique cluster of relatively large paragnaths; iii. has a rather wide transverse band of about three rows of very small paragnaths; iv. has an oblique cluster of about ten rather larger paragnaths. Unfortunately, in none of my specimens is the proboscis everted.

Fig. 1 b.

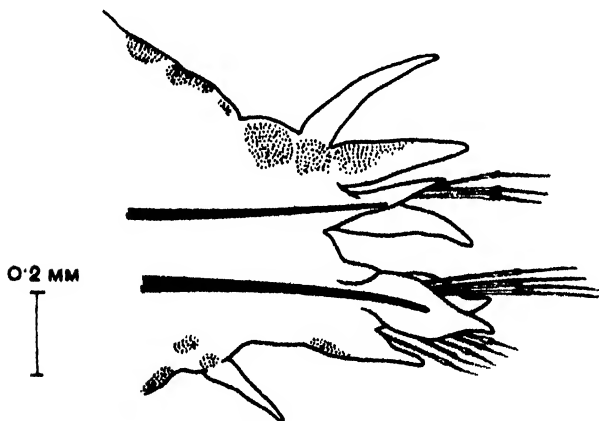


Ceratonereis burmensis, sp. n. 10th foot.

The rami of the feet are each supported by a single black aciculum. There is a short subulate dorsal cirrus. The dorsal ramus has three triangular languets, of which the median is slightly shorter than the rest. The ventral ramus has four languets. The anterior lip of the ventral chæta-sac sends out one and the posterior lip two languets, and below the chæta-sac there is a fourth ventral languet. All the ventral languets are about equal (fig. 1 b). The ventral cirrus surpasses a little the base of the ventral languet. From before backwards the languets become

rather more slender and pointed, and the median dorsal languet is reduced relatively to the two other dorsal languets. In the hindmost feet (fig. 1 c) the place of the two ventral languets issuing from the posterior lip of the ventral chæta-sac is taken by a single languet similar in form and size to that coming from the anterior lip of the ventral chæta-sac; furthermore, the ventral cirrus is reduced to a very small process. Pedal glands are present near the base of the dorsal cirrus, in the upper dorsal languet, in the lower dorsal languet, in the lower ventral languet, and at the base of the ventral cirrus. Those in the upper dorsal languet are the most conspicuous.

Fig. 1 c.



Ceratonereis burmensis, sp. n. Hinder foot.

For about the first ten chætigers there are only spinigerous bristles (fig. 1 d) in the feet. They are delicate and slender; and in the positions where in a typical nereid foot falcigers would be present the end-pieces of the bristles are considerably shorter (fig. 1 e) than those of the rest of the spinigers. Behind the 10th chætiger, and between it and about the 50th chætiger, the lower ventral bristle-bundle carries a number of modified falcigers (fig. 1 f). These approach in slenderness the shorter type of spiniger, but have the tip blunt and incurved instead of pointed. These falcigers are

confined to a short region in the neighbourhood of the 25th chætiger. Further back there are only spinigers.

The body ends in a pair of long pygidial cirri.

The heteroneids from off Bombay are all male. They

Fig. 1 d.

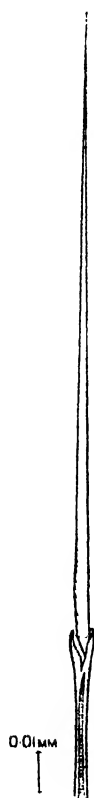


Fig. 1 e

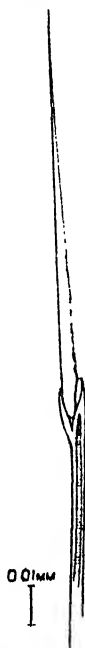


Fig. 1 f.



Ceratonereis burmensis, sp. n.

Fig. 1 d.—Longer type of spiniger.

Fig. 1 e.—Shorter type of spiniger.

Fig. 1 f.—Falciger.

are pale yellow in colour, except in front where the dorsum is brown. There is a considerable increase in the size of the eyes, but otherwise the head is not changed. The modification of the feet begins at about the 21st chætiger

and is completed at the 24th. The epitocous region occupies about the middle half of the body, the anterior and posterior quarters remaining unmodified. The body ends in a pair of anal cirri as in the atocous form.

Remarks.—This species is remarkable for the presence of modified spinigers in the middle region only. In the shape of the feet it is very close to *Nereis chingrighatensis* Fauvel (1932, p. 90), but differs in having no paragnaths on the proximal ring and also in having falcate bristles, lacking in Fauvel's species. *Ceratonereis microcephala* Grube has no falcigers in the hinder region, but the feet as figured by Fauvel (1932, p. 100) are much less complex. *Ceratonereis similisetis* Grube is an allied species, but differs in having no falcigers and also in the shape of the feet as figured by Grube (1878, pl. iv. fig. 4).

Family Capitellidæ.

Genus PARHETEROMASTUS, gen. nov.

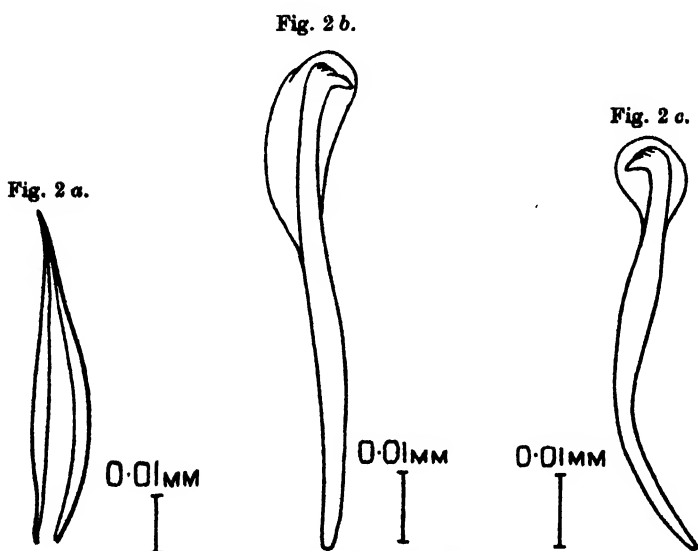
Thoracic region of twelve segments, of which eleven are chætigers. Of these eleven chætigers the first four carry bordered capillary bristles only and the remaining seven only hooks with narrow stems and long guards. The abdomen carries only hooks different from those of the thorax. There is no tessellation of the thorax. In the abdominal region there is little development of the parapodial tori and no branchiæ are present. The pygidium has a single, rather short cirrus.

Parheteromastus tenuis, sp. n.

Occurrence.—Maungmagan, Burma, *G. Gates*, one complete specimen and several fragments.

Description.—This is a small species. The complete specimen measures 50 mm. by 0.5 mm. for c. 140 segments. In spirit there is no colour. The body swells out in the anterior thoracic region, but otherwise is of much the same diameter throughout. The division between thorax and abdomen is not immediately seen, for there is no marked difference in length between the posterior thoracic and anterior abdominal segments. The prostomium is short, conical, and without eyes. The

buccal segment is about as long as the first chaetiger. There is a globular papillated pharynx. The first four chaetigers carry only short, widely bordered, capillary bristles (fig. 2 a). The remaining seven thoracic chaetigers carry only rather large hooks with narrow stems and long guards (fig. 2 b). The abdominal hooks (fig. 2 c) are smaller than the thoracic and have a subterminal enlargement and shorter and more rounded guards.



Parheteromastus tenuis, sp. n.

Fig. 2 a.—Anterior thoracic bristle.

Fig. 2 b.—Thoracic hook.

Fig. 2 c.—Abdominal hook.

The body in the long abdominal region is externally almost as featureless and homogeneous as that of an oligochaete (fig. 2 d). Its appearance differs a little from part to part in the same specimen and also from individual to individual. The parapodial ridges are for the most part very little developed, so much so that the limits of the segments are difficult to determine in certain areas. In the hindmost area of the abdomen the parapodial ridges are marked by a slight swelling of the

segments in the dorso-lateral and ventro-lateral regions, and this is most pronounced in the area adjoining the pygidium (fig. 2 e). There are no branchiæ and no branchial enlargements of the parapodial lobes. The hinder abdominal segments do not assume a companulate form.

The body ends in a single rather short pygidial cirrus.

Remarks.—I have erected the genus or perhaps subgenus *Parheteromastus* for this species, because, although it shows great affinity with Eisig's *Heteromastus*, it has only four instead of five thoracic chætigera bearing only

Fig. 2 d.

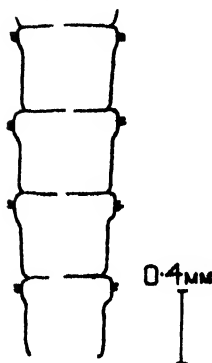
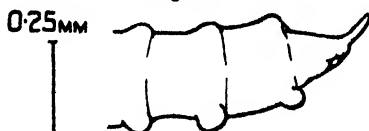


Fig. 2 e.



Parheteromastus tenuis, sp. n.

Fig. 2 d.—Segments from mid-abdominal region.

Fig. 2 e.—Terminal segments. Lateral view.

capillary bristles, and the number of hook-bearing thoracic chætigera is seven instead of six. Moreover, in *Heteromastus* branchiæ are present in the hinder abdominal region and the segments are campanulate in aspect. This is not so in the present form. *P. tenuis* is allied to the Indian Ocean *Heteromastus similis* Southern.

REFERENCES.

- FAUVEL, P. 1932. "Annelida Polychæta of the Indian Museum, Calcutta." Mem. Indian Museum, xii. (1), pp. 262, 9 pls., 40 text-figs.
 GRUBE, E. 1878. "Beiträge zur Kenntniss der Anneliden Fauna der Philippinen." Mém. Acad. sci. St. Petersburg, (7) xxv. no. 8, ix., 300 pp., 15 pls.

LV.—*Entomological Expedition to Abyssinia, 1926-7: Coleoptera, Carabidæ, Agonini* *. By L. BURGEON, Musée du Congo Belge, Tervueren, Belgium.

JE remercie le Dr. Hugh Scott qui a bien voulu me confier l'étude des *Agonum* récoltés par lui et par Mr. J. Omer-Cooper en Abyssinie. La série comprend 31 spécimens se répartissant en six espèces dont deux nouvelles †.

AGONUM Samouelle, 1819.

Agonum scotti, sp. n.

Longueur: 6 à 7 mm.

Rappelle la coloration de *A. xantholoma* Chaud., en diffère à première vue par les élytres luisants, à stries ponctuées, par les tarses antérieurs du mâle, etc. Se rapproche plus des *Agonum* (s. str.) paléarctiques.

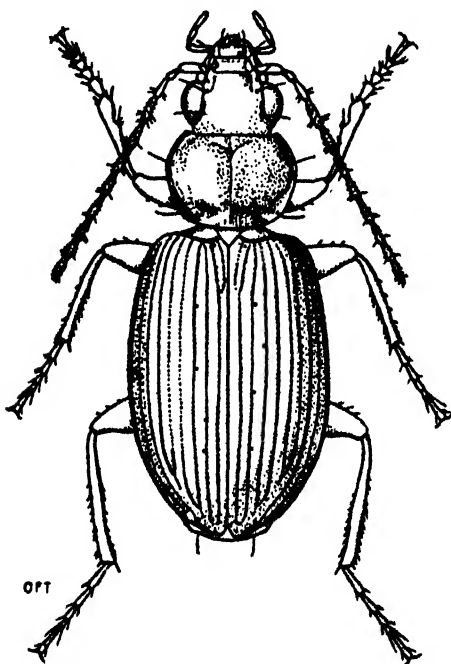
Ailé. Dessus noir luisant, les côtés du pronotum et des élytres étroitement brun-jaune. Pattes d'un testacé brunâtre, les fémurs plus clairs; antennes noirâtres, le premier article testacé, ainsi que la base des deux suivants. Dessous rougeâtre foncé, les épipleures du prothorax et des élytres jaunes. Tête grande, un peu plus étroite que le maximum de largeur du pronotum, yeux fort saillants, dépressions frontales assez profondes, longitudinales, non nettement limitées; fovéole centrale non ou peu visible; pas de sillon transversal ni d'étranglement à l'arrière; pas de ponctuation. Antennes dépassant la base du pronotum de quatre articles, pubescentes à partir de l'article 4. Pronotum transversal, ayant les contours de celui de *A. viduum* Panz.; angles postérieurs obtus, très arrondis, munis du pore sétigère normal; une gouttière étroite sur les bords, un peu élargie à l'arrière; dépressions basilaires assez profondes, non ponctuées; sillon axial bien marqué, terminé en V

* [This tribe of Carabidæ has been termed by some writers ANCHOMENINI, and *Anchomenus* has been regarded as synonymous with *Agonum*. In the recent catalogue, however, *Anchomenus* is treated as a subgenus of *Agonum* (Coleopt. Cat., part 115 (Carabidæ, Harpalinæ V.), pp. 822, 857, 1931). Two species of *Megalonychus*, belonging to the AGONINI, were included in the general report on Carabidæ by O. Alluaud, Ann. & Mag. Nat. Hist. (10) xix. pp. 272-287, Feb. 1937. They are mentioned again in parenthesis at the end of M. Burgeon's paper, to render the account of the AGONINI complete.—HUGH SCOTT.]

† [These numbers do not include the two species of *Megalonychus* mentioned on p. 544.—H. S.]

à longues branches à l'avant. Disque bombé, lisse à part des traces de stries transversales se détachant du sillon axial, milieu de la base faiblement sculpté. *Elytres* oblongs, bombés ; rebord basilaire moins avancé à l'épaule et plus arrondi que chez *A. viduum* ; longuement arrondis à l'arrière avec une sinuosité faible ; profondément striés, les stries nettement ponctuées, paires à l'extrémité, 3 et 4, 5 et 6 prolongées par un trait

Fig. 1.

*Agonum scotti*, sp. n., ♂, × ca. 10.

commun, 7 arrivant presque à l'apex. Intervalles peu bombés, luisants, leur microsculpture peu visible au grossissement 72 ; l'intervalle 3 avec ordinairement quatre petits pores, parfois plus ou moins ; série ombiliquée pouvant se représenter, en commençant à l'épaule, par la formule : 5—1— —1—2—2—4, le groupe 1— —1 situé vers la mi-longueur. Dernier arceau ventral comptant deux pores chez le mâle et quatre chez la femelle. *Tarses* antérieures du mâle ayant le premier article long,

les deux suivants très courts et larges, le 4 petit, échancré ; aux autres paires articles longs, sillonnés de chaque côté ; les 4 faiblement échancrés, les 5 pileux en dessous.

Loc. Abyssinia : " Mt. Zukwala, from edge of lake in crater, 9000 feet, x. 1926, 8 ex. (*Scott*) ; Mt. Chillalo, ca. 8000 feet, 8. xi. 1926, 4 ex. (*Omer-Cooper*).

Certains spécimens ont la base des élytres creusée autour du scutellum, malformation signalée déjà chez divers Carabidæ européens habitant le bord des eaux. Un spécimen du mont Chillalo a les angles postérieurs du pronotum coupés très obliquement, ce qui lui donne un contour presque elliptique ; c'est également une malformation.

Agonum shoanum Alluaud, Bull. Mus. Hist. nat. Paris, xxiv. p. 495, 1918.

Un spécimen de la série a été obligeamment comparé à un exemplaire typique par M. Alluaud. Espèce décrite des environs d'Addis Ababa, vers 2400 m. (7800 pieds) d'altitude. Elle ressemble à *A. bogemanni* Gyll., d'Autriche, mais n'a pas ses antennes courtes. Yeux grands, mais moins saillants que chez *A. scotti*. Pronotum de contours bien différents de ceux de cette espèce : non transversal, subcordiforme, rétréci à la base. Elytres plus plats que chez *A. scotti*, légèrement évasés en arrière ; stries plus ou moins nettement ponctuées ; intervalles plats, le 3 à trois pores dont le premier assez proche de la base, contre la strie 3, le second avant le milieu contre la strie 2, ainsi que le dernier. Dernier arceau ventral ayant aussi deux ou quatre pores, selon les sexes. Pattes et tarses antérieurs du mâle plus longs que chez *A. scotti*, tarses sillonnés de chaque côté, les articles 5 sétulés en dessous.

Loc. Abyssinia : " Mt. Chillalo, ca. 8000 feet, from edge of mountain-stream, 8. xi. 1926, 9 ex. (*Scott*) ; Debra Libanos, ca. 8000 feet, 2. i. 1927, 1 ex. (*Scott*)."

Agonum sp.

Une femelle de 6.5 mm. récoltée au mont Zukwala dans le cratère à 9000 pieds, 26. x. 1926 (*Omer-Cooper*), se rapproche de *shoanum* ; pronotum plus étroit, presque en hexagone ; élytres mats, leurs stries fortes, non ponctuées, les intervalles plats.

Agonum sp.

Un mâle de 9 mm. est bien distinct des espèces précédentes ; il ne me paraît pas pouvoir être rapporté à aucune espèce décrite d'Abyssinie : ravin Wachacha, près Addis Ababa, 8000 pieds environ, 9. ix. 1926, " from native scrub " (Scott).

Subgenus *MEGALONYCHUS* Chaudoir.

Agonum (*Megalonychus*) *apud subvirescens* Laf.

Un couple se rapproche de la description de cette espèce de Guinée, signalée d'Abyssinie par Chaudoir ; il faudrait pourvoir faire la comparaison avec des spécimens typiques.

Loc. Abyssinia : " Jem-Jem Forest, ca. 8000 feet, from bed of river, 2. x. 1926 (Scott). "

Agonum (*Megalonychus*) *jemjemense*, sp. n.

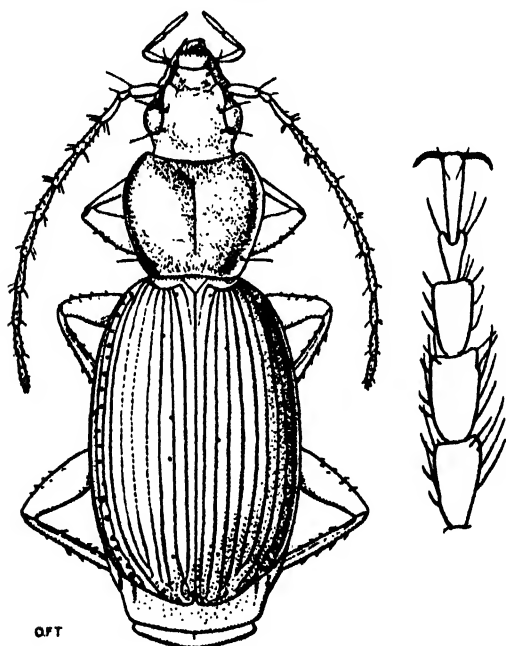
Longueur : 9 à 10.5 mm.

Proche, d'après la description, de *A. luctuosum* Reiche, qui est plus grand avec les pattes brunâtres, les élytres oblongs, etc. Ressemble à *A. chagga* Alluaud, dont un spécimen typique, d'Afrique orientale, figure dans les collections du Musée du Congo.

Aptère Noir un peu luisant dessus, élytres mats, d'un brun marron ; côtés du pronotum étroitement testacés ainsi que le premier article des antennes, les palpes et les fémurs ; tibias et tarses légèrement rembrunis. Dessous noir luisant, épipleures, extrémité de la saillie du prosternum et les hanches (les postérieures vers l'extrémité seulement) testacées. Tête lisse, de même forme que chez *A. chagga* ; antennes un peu moins longues. Pronotum non transversal, contrairement à *A. luctuosum*, notablement plus étroit que chez *A. chagga*, plus rétréci vers la base qu'à l'avant, sa largeur maxima avant le milieu ; angles antérieurs peu avancés, les postérieurs très largement arrondis comme chez *A. chagga* ; bords relevés de même ; disque portant de fines stries transversales assez serrées ; base aciculée longitudinalement, les côtés ponctués. Élytres ovalaires, presque plats ; rebord basilaire anguleux à l'épaule ; stries fines, simplement crénelées, moins nettement ponctuées que chez *A. chagga* ; intervalles plats à microsculpture dense, isodiamétrique (bien plus forte que celle de *A. scotti*), plus forte que celle du pronotum qui est étirée

transversalement; intervalle 3 à trois pores, placés comme chez *A. luctuosum*; série ombiliquée à 20 pores, les 3, 10, 13, 16 et 19 plus grands que les autres, un peu plus externes et faisant dévier les stries; angle sutural non épineux. *Métépisternes* plus larges à la base que longs, faiblement sculptés avec des traces de points à l'avant. Un groupe de gros points au premier arceau

Fig. 2.



Agonum jemjemense, sp. n., ♀, × ca. 8; ♂, tarse anterior gauche.

ventral contre les métépimères. Dernier arceau ventral ayant deux pores chez le mâle et quatre chez la femelle. *Tarses* antérieurs du mâle ayant le premier article en long triangle, les deux suivants en longs rectangles, ni sillonnés ni carénés; aux autres paires il y a une fine carène médiane, articles 4 à peine échancrés au bout, les 5 sétulés en dessous.

Loc. Abyssinia: "Jem-Jem Forest, ca. 8000 feet, ix. 1926, 3 ex., including one from a very dense, shady spot (Scott, Omer-Cooper)."

Var. Un couple, pris dans la même région sous l'écorce de grands arbres à la limite de la forêt, a les élytres noirs ; le mâle présente une petite dent à l'angle sutural des élytres.

[Les deux espèces suivantes ont été déjà signalées dans le travail de M. Charles Alluaud sur les Carabidæ de l'Expédition, Ann. & Mag. Nat. Hist. (10) xix. p. 281 (1937) :—

Agonum (Megalonychus) acanthurum Gestro.

— (—) *luctuosum* Reiche.

Toutes les deux sont connues seulement d'Abyssinie et ont été retrouvées par l'Expédition dans diverses localités entre 5000 et 7000 pieds d'altitude, plus basses que celles où se trouvaient les espèces décrites ou énumérées ci-dessus.]

LVI.—*Descriptions and Records of Bees.*—CLXI.

By T. D. A. COCKERELL, University of Colorado.

ALL the bees described below are the property of the British Museum.

Crocisa nilotica, sp. n.

♂.—Length about 13 mm., anterior wing 11.

Robust, black, with pure white markings ; flagellum thick, third antennal joint distinctly longer than fourth ; head in front and behind with copious white hair, the occipital fringe not interrupted ; white prothoracic band broad and dense, very weak but not entirely interrupted in middle, the adjacent white hair on mesothorax present but thinner ; median band on mesothorax long-pyriform, very broad in front ; discal spots of mesothorax larger, about twice as far from median band as from lateral bands ; lateral bands entire, broadly connected with the large triangular posterior marks ; axillæ covered with white hair ; scutellum finely punctured, without markings, the margin W-like, but the edge near the incision on each side bulging ; white hair from beneath margin ; upper half of mesopleura and region below wings densely covered with white hair, lower part coarsely punctured, and with small inconspicuous tufts of white hair ; a patch of white hair at base of wings ; wings rather dilute reddish fuliginous, the hyaline marks

poorly defined ; front tibiæ densely covered with white hair on outer side and their tarsi with white hair ; middle and hind tarsi entirely black, the hind tarsi broad ; middle and hind tibiæ with dense white hair on outer side, but the apical part (fully two-fifths of hind tibiæ) black ; abdomen with widely interrupted broad white bands, the lateral marks of first tergite having the form of a very thick V ; the lateral marks of tergites 2 to 4 pointed mesad, but on fifth obtuse ; apex strongly bidentate, the sides of the broad apical plate strongly keeled ; venter immaculate ; margin of fifth sternite with dense black hair.

Uganda : three from banks of Nile near Kakindu, 3400 ft., Aug. 24-25, 1911 (*S. A. Neave*).

The end of the abdomen agrees with what I have determined as *C. excisa* Friese, from Dimbroko, French West Africa ; but the insect can be separated from *C. excisa* by the white-haired axillæ, the median band of mesothorax much broader anteriorly, the paler anterior wings, and the marks on tergites 2 to 4 pointed mesad.

Crocisa aspilota, sp. n.

♀.—Length about 13·5 mm., anterior wing 10.

Black, very robust, with white markings on head and thorax, but light blue on abdomen ; clypeus dull and minutely punctured ; third antennal joint a little longer than fourth ; middle of occiput with black hair ; median band on mesothorax well defined, but greyish ; dense pure white spots (not bands) above tegulæ ; no discal spots ; mesopleura with less than upper half covered with white hair ; posterior white spots on mesothorax rather small, distant from spots above tegulæ ; axillæ with a little white hair on inner side ; scutellum without markings, the lobes long, the margin W-like ; white hair beneath incision ; anterior wings very dark, and hind wings suffused with brown ; middle and hind tibiæ with light hair on basal half of outer side, rather bluish on middle tibiæ ; hind basitarsi with light hair ; hind femora unarmed ; abdomen broad, with lateral light blue markings ; on first tergite large patches, far apart, angularly incised mesad ; on second to fifth successively smaller marks, obtuse at inner end, that on second not produced anteriorly ; venter immaculate ; fifth sternite conspicuously keeled on apical half.

Natal: Malvern (*J. P. Cregoe*, Brit. Mus. 1904-46), 2 ♀.

Closely allied to *C. tenuicornis* Ckll., from Katanga, but with the thoracic marks white, strongly contrasting with those of the abdomen. *C. tenuicornis* does occur in Natal, a female having been taken by H. P. Thomasset at Weenen, Dec. 1927. It is considerably less robust than the same sex of *C. aspilota*.

Crocisa microsoma, sp. n.

♀.—Length 9.5-10.5 mm. (depending on contraction of abdomen), anterior wing 7.8 mm.

Black, robust, with pure white markings; labrum with a median pit; face, front, occiput, and cheeks covered with white hair, the occipital fringe entire; flagellum quite long, middle joints longer than broad, third antennal joint much longer than fourth; prothoracic white band well developed, linear in middle, continuous with broad patches of long hair on mesothorax, which are only narrowly separated from the broad median band, or they may be continuous with it; discal spots of mesothorax very distinct, equally distant from median and lateral bands; lateral bands continuous with anterior marks, and posteriorly narrowly connected with the triangular posterior marks; axillæ with a patch of white hair on inner side; scutellum finely punctured, the incision forming a very wide angle, above it a transverse band of white hair, beneath the usual white hair; no discal spots on scutellum; upper half of sides of thorax densely covered with white hair, but no lower band; tegulæ with a spot of white hair posteriorly, close to the similar spot on base of wing; anterior wings very dark, shining violaceous, with the usual hyaline spots; hind wings dilute brownish apically; tibiæ with dense white hair on outer side, lacking on apical third of middle tibiæ, and on apical two-fifths of hind ones; tarsi black, without light markings; hind femora simple; abdomen broad, the white marks at sides of first tergite U-like, with short arms; the bands on the other tergites shorter than the interval between them, that on second with an angular projection above; the inner ends of abdominal marks on second and following tergites very obtuse, somewhat pointed on first; venter immaculate; fifth sternite shining at apex, with no distinct keel.

Nyasaland : Chiromo (type-locality), 2 ♀ (*R. C. Wood*) ; Karonga, 1914, 1 ♀ (*Dr. N. Leys*).

In Meyer's table it runs near *C. erythræensis* Meyer, from Erythrea, but it is smaller, with spots on axillæ. It seemed to closely resemble *C. nigrita* Friese, from Willowmore, but a close study of Friese's description convinces me that his species is *C. valvata* Brauns. Except for the marking of the scutellum, there is a very close resemblance to *C. polysticta* C. & M., which is probably the nearest relative.

Crocisa ogilviei, sp. n.

♂.—Length about 10 mm., anterior wing 8.3.

Pubescent markings all white ; end of abdomen broadly truncate, with sharp corners. At first sight this appeared to go with *C. valvata* Brauns, but it differs by the deep red eyes, the apical bands on first two tergites longer, the apical truncation of abdomen broader ; face narrower below ; scape smaller ; third antennal joint shorter. The abdominal pattern and the form of the scutellum agree with *C. calceata* Vachal. The hind basitarsi have a short stripe of white hair on basal half only, and the second and third sternites have obscure whitish patches at sides. The scutellum has strong but widely separated punctures, and the median band on mesothorax is narrow. The abdominal bands (lateral marks) are considerably narrower than in *C. braunsiana* Friese. The discal spots of mesothorax are represented by long hairs.

Cape Province : Huguenot, Feb. 5–10, 1932 (*J. Ogilvie*).

Crocisa odontura, sp. n.

♂.—Length 8 mm. (abdomen much contracted), anterior wing 8.

Very robust, with pure white markings ; eyes converging below ; face and front densely covered with white hair ; occipital fringe very long, entire ; third antennal joint much longer than fourth ; anterior half of mesothorax (precisely as in *C. hyalinata* Vachal) covered with white hair, long but not dense enough to hide the surface ; broadly interrupted band of long hair on prothorax appearing whiter, as also tufts before tegulæ ; posterior marks of mesothorax transverse, dense, very white, overlapping margin of axillæ, but the


coarsely punctured axillæ not white-haired; scutellum immaculate, very coarsely punctured, the angle of incision very wide, the margin on each side with a slight double curve; long white hair from beneath incision; sides of thorax with upper half covered with long white hair, but none on lower half; tibiæ on outer side densely covered with white hair, on hind tibiæ reaching almost to apex; basitarsi without white hair, but a patch of white on last tarsal joint of middle and hind legs; hind femora unarmed; abdominal bands very widely interrupted in middle; first tergite with a thick U-like mark on each side; bands on second tergite with a long extension upwards at extreme side; inner ends of lateral marks or bands very obtuse; venter immaculate; apex with a pair of very strong teeth, close together.

N. Bechuanaland: Ghanzi, Mongalatsila, on gsutsu bush, Sept. 25, 1924 (*J. Maurice*).

Very much like *C. microsoma* Ckll., but apparently not its male, on account of the much more coarsely punctured scutellum. It also differs in having the hind tibiæ covered with white hair on outer side, except at extreme tip, but this may be a sexual character. The thorax anteriorly resembles that of *C. hyalinata* Vachal, but that has the apex of abdomen entirely different.

Crocisa macrura, sp. n.

♂.—Length about 9.5 mm., anterior wing 8.

Robust, black, with pure white markings; head broad, eyes grey; third antennal joint short, but a little longer than fourth; sides of face with abundant white hair; occipital fringe rather short, greyish in middle; white patches on prothorax and adjacent mesothorax widely separated, and the narrow bands above tegulæ neither uniting with them nor with the oval posterior spots; median band of mesothorax narrow, broadest and truncate in front; discal spots very small; axillæ all dark; scutellum well punctured, margin -like; long white hair from beneath incision; some white hair just below wings, and a large round patch on upper part of pleura, having an extension anteriorly, below an intensely black round area; no white hair on lower part of pleura; tegulæ with a white spot posteriorly; anterior wings dark, with the usual hyaline spots, and two hyaline streaks in the first cubital cell; hind wings dilute brownish apically; front and middle tibiæ densely covered with

white hair externally except at apex, hind tibiae with about the apical third bare, the edge of the white very oblique; hind basitarsi covered with white hair on outer side; hind femora unarmed; abdomen very broad, with successively smaller pure white marks on sides of tergites 1 to 5, and very small spots at sides of sixth; marks on first tergite having much the form of a human foot, with the toe (end of apical band) mesad, or of a thick L, the basal band not developed, represented only by an angular projection; bands on second tergite with a triangular extension above; inner ends of bands on tergites 2 to 5 obtuse but not truncate; apex of abdomen very broad, with a rounded lobe in middle and a small tooth at each side (style of the otherwise wholly different *C. picta* Sm. and *C. splendidula* Lep.); venter with small patches of white hair at sides of sternites 2 to 4.

Cape Province: Somerset East, alt. 2304 ft., Nov. 1930 (*R. E. Turner*).

This has the aspect of *C. microsoma* Ckll., but differs by the marks on first tergite, the lack of white hair above the scutellar incision, and the pattern of the thorax.

Crocisa gowdeyi, sp. n.

♀.—Length about 13 mm., anterior wing 10.5.

Very robust, black, with pure white markings; face densely covered with white hair; occipital fringe entire, but slightly greyish in middle; a very strong keel on middle of supraclypeal area, extending up between antennae, and forking about halfway up front; sides of vertex, near ocelli, smooth and polished; a small pale red mark at extreme end of scape; third antennal joint a little longer than fourth; marks on prothorax, with contiguous large marks on mesothorax, widely interrupted in middle, but continuous with the bands passing above tegulae, these, however, ending narrowly, not reaching the broad-triangular posterior spots of mesothorax; median band of mesothorax rather narrow, pointed in front, and discal spots rather small, a little nearer to lateral bands than to median one; upper half of sides of thorax densely white-haired, with only a short dark line between the upper and lower portions; at sides below are three white spots in a row, the third on the middle coxae, the hind coxae also with a white patch; axillae with large white spots, not covering

the whole surface; scutellum with margin W-like, no white hair above incision, but a pair of large discal spots, a little nearer to sides than to hind margin; tegulæ with a white spot behind, and a spot on base of wing; anterior wings reddish fuliginous, the hyaline marks feeble; base of wings not hyaline; hind wings brownish apically; tibiæ with dense white hair on outer side, hind tibiæ with the apical third bare, and the white with some black spots; basitarsi with white hair on outer side; hind femora unarmed; middle femora conspicuously marked with white behind on apical half; front femora with long white hair at apex behind; abdomen dorsally with very strong tints of golden-green, especially on first two tergites; lateral marks on first tergite U-like, the anterior arms a little longer than the posterior, narrow and pointed, the interval between them about as wide as the white fringe below scutellum; marks on second tergite with an angular extension basad; inner ends of marks on tergites 2 to 5 very obtuse; venter with white patches sublaterally on sternites 3 and 4; fifth sternite with a shining prominence at extreme tip.

Uganda: Entebbe, June 12, 1913 (*C. C. Gowdey*).

A handsome species, evidently near to *C. pica* Strand, but distinguished by the strongly metallic abdomen, and apical part of hind tibiæ bare. The metallic abdomen suggests *C. meyeri* Ckll., but that has the colour blue-green and the anterior wings hyaline at base. It is also allied to the much larger Abyssinian *C. fortissima* C. & M.

Crocisa cæca, sp. n.

♂.—Length about 12 mm., anterior wing about 10.8.

Black, robust, with fusiform abdomen, all the pale markings pure white; eyes large, greenish grey, converging below; labrum with a broad median channel; a strong keel between antennæ; clypeus dull, very minutely punctured; antennæ reaching base of scutellum, third and fourth joints about equal; white occipital fringe not interrupted; mesothorax strongly punctured, the median band rather narrow, of long loose hairs, paired discal spots absent (the specific name refers to the absence of these eye-like spots); prothoracic band hardly interrupted, separated from lateral bands by a little black hair, lateral bands very broadly connected

with posterior spots, which are large; axillæ with a little white hair at base; scutellum immaculate, margin sharply W-like, white hair from beneath margin; upper half of sides of thorax densely covered with white hair; below, there are only a few white hairs; tegulæ reddened in middle, and with a small white hair-spot behind; wings not very dark; tibiæ with dense white hair on outer side, on hind pair confined to the basal two-fifths; tarsi entirely black; hind femora beneath with a minute denticle near base; lateral marks on first tergite broadly V-like, the bands not broadly interrupted, the basal ones with inner ends sharply pointed, the black area fusiform; bands on tergites 2 to 5 broad, widely interrupted, inner ends obtuse, bands on second tergite with a small angular projection at sides above; sixth tergite with a subtriangular white mark on each side; apical plate narrow, truncate, weakly emarginate in middle; venter immaculate.

Kenya: Kisii District, S. Kavirondo, 5000 ft., May 9-12, 1911 (S. A. Neave).

In Meyer's table it runs out at 20. By the absence of spots on mesothorax it resembles *C. kabetensis* Ckll. and *C. oxyaspis* Ckll., but these have quite different markings on the first tergite.

Crocisa pulchripicta, sp. n.

♀.—Length about 12 mm., anterior wing 10.8.

Moderately robust, black, the femora very faintly reddish; markings light blue, white on upper half of sides of thorax (only a few light hairs below), and long white hair from below scutellum; labrum reddish, with a longitudinal channel; occipital fringe black in middle (really interrupted, with black hair on vertex before it); third antennal joint longer than fourth; widely separated spots on prothorax, contiguous with smaller and bluer ones on mesothorax, these not joining lateral bands, which posteriorly are rather broadly joined to the triangular posterior spots; median band of mesothorax broad, short, parallel-sided; discal spots large and round, very slightly nearer to lateral bands than to median one; axillæ and scutellum entirely immaculate; punctures of scutellum emitting plumed black hairs, all arranged so as to give the effect of a striate surface; incision of scutellum forming a very wide angle, but the


inner margins straight, except that the actual incision shows a semicircular excavation; tegulae with a large blue spot behind, but no spot at base of wing; wings very dark; tibiae with pale blue hair on outer side, lacking on apical two-fifths of middle tibiae, the margin of the blue very oblique, and hind tibiae with nearly the apical half bare; hind femora unarmed; marks on first tergite broadly V-like, the arms about equally long; bands on tergites 2 to 5 more broadly interrupted, the inner ends very obtuse, on second tergite a strong angular extension basad; apical plate narrow; venter and tarsi immaculate.

Gold Coast, British Nyive (Brit. Mus. 1926-501).

Very like *C. grahami* Ckll., but that has light hair on basitarsi, and lateral bands of mesothorax not connecting with posterior spots. The type of *C. grahami* is 9.5 mm. long.

Crocisa uelensis, sp. n.

♂.—Length about 13 mm., 4.5 between the wings, anterior wings 11 mm. long.

In nearly all respects like *C. pulchripicta*, of which I at first thought it to be the male, but the following differences appear to be specific. Conspicuously more robust; margin of scutellum -like, the inner margins with a double curve; markings of abdomen brighter blue; wings reddened, not so dark, the hyaline markings almost obsolete; middle tibiae very broad, with a large crescentic yellowish-white patch on basal half, contrasting with the pale bluish of front and hind tibiae. The apical plate of abdomen is very broad, with sharp dentiform corners; it seems to have a long sharp tooth in the middle, but this is the end of the apical sternite. The venter and middle and hind tarsi are immaculate, but the front basitarsi have thin whitish hair on outer side. Third antennal joint about as long as fourth. There is a light spot at base of wing.

Belgian Congo: Amadis, Uele River, 3° 30' N., 23° to 30° E. (*Rodhain*).

Received from Dr. J. Bequaert. In the form of the scutellum this resembles *C. gabrielis* C. & M., and I thought it might be its male, but it is larger, with no spots on axillae and different markings on first tergite. The apex of the abdomen at once separates it from *C. excisa* Friese, which also has much paler markings.

THE ANNALES

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No 114. JUNE 1937.

LVII.—*On a remarkable Fish from the Lower Permian of Autun, France.* By T. S. WESTOLL, B.Sc., Ph.D., Department of Zoology and Comparative Anatomy, University College, London.

I. INTRODUCTION.

In January 1935 the author, while examining various species of *Amblypterus* for purposes of comparison with faunas then being studied, found that the little fish from Autun known as *Amblypterus blainvillei* Ag. showed certain novel cranial features which are of considerable comparative interest. A short anatomical study of the material is presented here. There are still some points of interest left unsettled, and as there is a large quantity of material, scattered through various museums, which he has not been able to use in this description, the writer hopes to return to the problem on some future occasion.

The writer wishes to offer his most grateful thanks to Prof. M. Boule and M. J. Piveteau (of the Museum de l'Histoire Naturelle, Jardin des Plantes, Paris), to Prof. Jacob (of the Geological Laboratories in the Sorbonne), and to Dr. W. D. Lang and Dr. E. I. White (of the British Museum, Natural History) for allowing him to have access to or to borrow material and for facilities granted in their various departments. He wishes to thank Prof. D. M. S. Watson for his continued help

and interest and for reading this manuscript. The investigation has been carried out with the aid of a Senior Research Award of the Department of Scientific and Industrial Research.

II. MATERIAL AND OCCURRENCE.

"*Amblypterus*" *blainvillei* Ag. is a small fish, rarely as much as 15 cm. long, and occurs in great numbers in thin-bedded grey fissile, carbonaceous shales from Muse, near Autun. These shales have a fairly rich vertebrate fauna, and contain frequent clay-pellets and occasional coprolitic masses. On some of the bedding-planes of these shales the fishes lie thickly strewn; and it can often be observed that fishes on any one bedding-surface are of the same size within a few millimetres, or that two markedly distinct such size-groups may be present. It seems very likely that each of these size-groups on a bedding-plane corresponds to one year group. This suggests that by examining sufficient material it should be possible to estimate the annual increment in length at any growth stage, but material available for measurement is insufficient. The great abundance and complete nature of the fossils suggests some form of mass-killing of shoals, possibly occasional de-oxygenation of the pools owing to excess of decaying organic matter.

The preservation of the material is rather variable; the thinness of most of the head-bones leads to indeterminate squashes in many cases, and decomposition of pyrites or marcassite is often drastic in its effects. Scales and fins are usually quite well preserved.

The age of the fish-bearing beds is Autunian (Lower Permian), and the Muse fossils come from the "étage moyen."

III. HISTORICAL.

The fish was first described by de Blainville (1818) under the names *Palæothrissum inæquilobum* and *P. parvum*, but, in common with his other descriptions, the definitions were imperfect and inadequate. The very much fuller description of Agassiz (1833) showed that *P. parvum* is only the young of *P. inæquilobum*, and as these were badly defined by de Blainville, we may accept

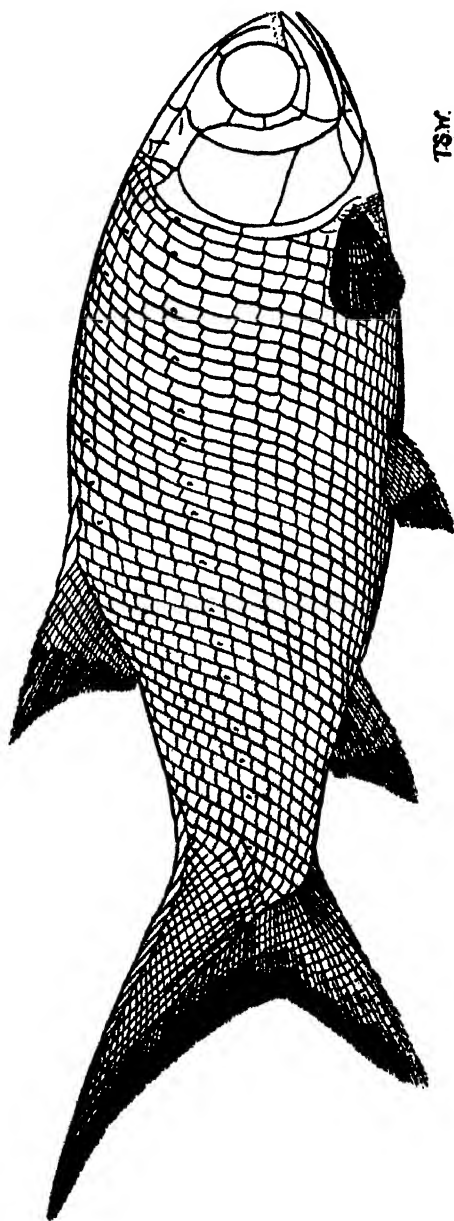
Agassiz's name *Palæoniscus blainvillei* Ag. It seems likely (though the writer has not seen the types) that *P. voltzii* Ag. and *P. angustus* Ag., from the same locality, are synonyms of *P. blainvillei*.

Further examples were beautifully figured by Landriot (1839), who added considerably to our knowledge of the fish. The three species of Agassiz mentioned above were provisionally put in the genus *Amblypterus* Ag. by Traquair (1877). This arrangement was followed by Smith Woodward (1891), who suggested that *A. angustus* may be the young of *A. voltzii*.

In 1890 Sauvage published the first of three works on the Autun fish-fauna. Owing to his habits of forming new species on the grounds of body-form, etc., these works cannot be said to help in an enquiry into the synonymy of *A. blainvillei*, and it must be left to some future occasion to determine the value of his many new species. In his work Sauvage pointed out that Agassiz's three species should be removed from the genus *Palæoniscus* and should be placed in the *Amblypterus* group, "malgré les différences avec l'espèce typique, *Amblypterus latus*. Les nageoires sont toutes beaucoup moins développées, à part la caudale; les fulcres sont plus gros; la squamation est un peu différente; mais, lorsqu'on étudie les caractères un par un, il est difficile d'en trouver qui aient une valeur générique suffisante permettant de séparer les espèces précitées des *Amblypterus* proprement dits: on ne constate que des caractères de sections permettant seulement de grouper les espèces autour de certains types plus particulièrement définis" (p. 5). Of the several groups of *Amblypterus* so set up, the distinguishing characters appear to be of doubtful value. *A. angustus* is placed in a different group from *A. inæquilobum* (Blainv.) (= *A. blainvillei* (Ag.)), and is described as having the same form of preopercular as in "les *Amblypterus* typiques." Further, "Le maxillaire est large à son extrémité postérieure" (p. 13). A small fish is named *Palæoniscus landrioti* Sauv., differing from *A. angustus* in having denticulated scales; the present writer finds such pectination common in *A. blainvillei*.

In his second paper (1893) Sauvage made a further statement on the division of the genus *Amblypterus*

Fig. 1.

T.S.W.
136Restoration of *Eduella blainvilliei* (Ag.), lateral view. Length about 100 mm.

into groups, and named another batch of new species of which the real value must remain uncertain till the types can be examined. The third paper (1895) deals with some very young *Amblypterus*, which apparently show similar features to the young *Brookvalia* described by Wade (1935): the scales on the body in these young forms appear to be restricted to the neighbourhood of the lateral lines.

It would not be prudent to discuss Sauvage's species without access to the types, but from his figures it seems that many of them are at least very closely related to "*A.*" *blainvillei* Ag. as represented by the material at my disposal, all of which appears to be conspecific. In this note, therefore, no synonymy is attempted.

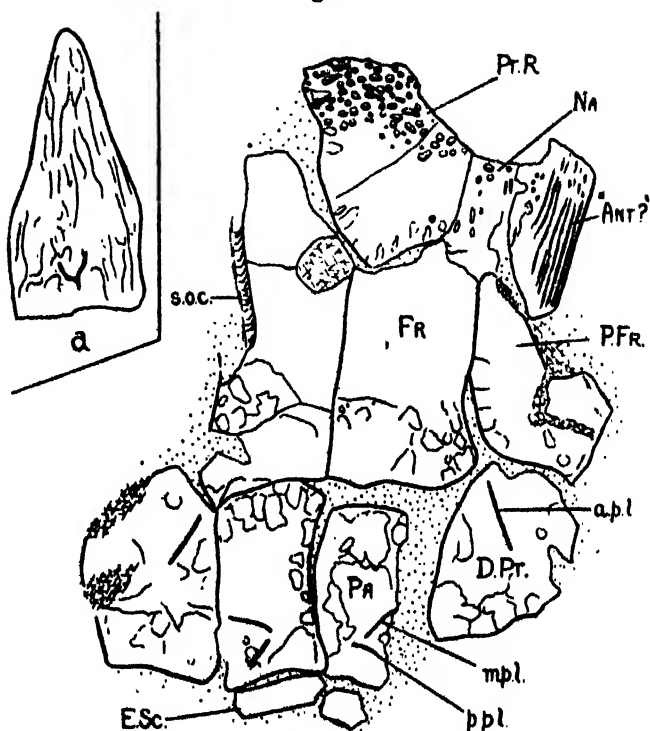
IV. DESCRIPTION OF MATERIAL.

The fish is of a rather stoutly fusiform outline (fig. 1) and is remarkably Semionotid-like in appearance, except for the long Palæoniscid tail. The head is short and deep, measuring just less than one-fifth of the total length. The greatest depth of the body is just in front of the dorsal fin, and is about a quarter of the total length. The dorsal fin arises from an excavation in the dorsum, rather like that seen in a Semionotid. The caudal pedicle is stout and the tail is completely heterocercal and markedly inequilobate. The dorsal fin arises slightly in front of the middle of the fish, and is almost entirely opposite the gap between anal and pelvics. The anal is very little smaller, and is slightly nearer to the caudal than to the pelvics. The paired fins are somewhat smaller and the pelvics are nearer to the pectorals than to the anal. All the fins are well developed.

Skull.—The head is deep and exceptionally broad, with large orbits, and the snout is also extremely wide; there is apparently no rostral prominence. The skull-roof, indeed, is so broad that the distance from the back of the parietals to the front of the postrostral is almost the same as the breadth across the "post-frontals" (figs. 2, 3).

The parietals are sturdy bones, together broader than long. The frontals are larger elements, together as broad as long. Their anterior margins are embayed to receive the median postrostral, which is a remarkably

Fig. 2.



Eduella blainvillei (Ag.). Skull-roof of P.12091 (Brit. Mus., Nat. Hist.), $\times 3.5$. a, median gular of same specimen, with pit-line groove, $\times 3.5$.

Explanation of lettering for text-figs. 2-7.

"ANT?" "Antorbital?"

BR. 1, 2. Branchiostegal rays.

CL. Clavicle.

D.PT. Dermopterotic.

E.Sc. Extrascapular.

FR. Frontal.

G.M. Median gular.

I.O. Infraorbitals.

L. Scale-covered lobe of pectoral fin.

MD. Mandible.

MX. Maxillary.

NA. Nasal.

OP. Opercular.

PA. Parietal.

"P.FR." "Postfrontal."

P.O. Postorbital.

P.OP. Preopercular.

Pr.R. Postrostral.

Sc. Scale.

S.OP. Subopercular.

T. Teeth.

a.p.l. Anterior pit-line.

br.pl. Pit-line groove on branchiostegal.

g.p.l. Gular pit-line.

i.o.c. Infraorbital canal.

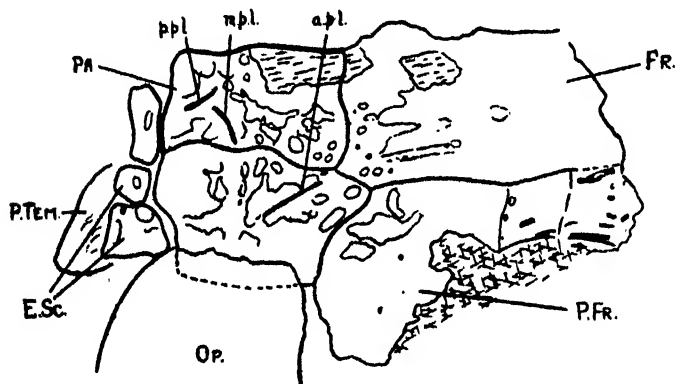
m.p.l. Middle pit-line.

p.p.l. Posterior pit-line.

s.o.c. Supraorbital canal.

broad bone: its anterior margin is almost straight and transverse, but is usually badly preserved. The dermo-pterotic (so called to avoid the supratemporo-inter-temporal controversy) is a little longer and broader than the parietal: it touches the frontal anteromesially, and has a broad contact with the very large "postfrontal" bone, which includes the dermosphenotic of many authors. The "postfrontal" is truly immense, forming the postero-dorsal margin of the orbit and extending nearly as far forwards as the frontals. In front of the "postfrontal" is a rather narrow bone forming the front of the orbit; between this bone and the postrostral is an element,

Fig. 3.

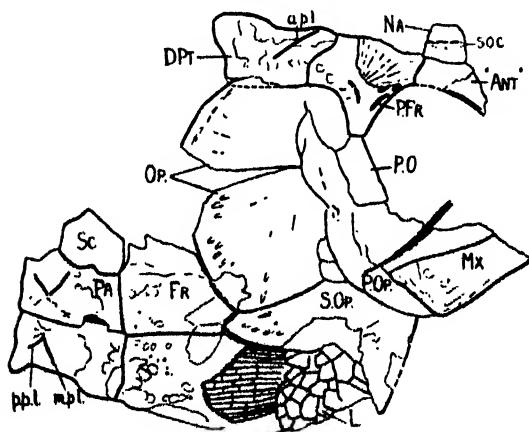


Aduella blainvillei (Ag.). Skull-roof of specimen in the Sorbonne (T. S. W., I., a), $\times 5$ approx.

never well seen, which carries the supraorbital sensory canal, and is the nasal. The bone in the orbital margin is of uncertain homology. It is reminiscent of the bone usually called "antorbital" (posterior antorbital) in Osteolepids (see Säve-Söderbergh, 1934; Westoll, 1936), and, like that element, it appears to be unconnected with any sensory canal: it is thus not likely to be the homologue of the antorbital of *Amia*, but will be called "antorbital?" in this work in a purely non-committal manner. Unfortunately, the bones of the snout are always badly preserved in my material, and it is impossible at the moment to distinguish the nostril-openings.

All the skull-roofing bones are provided with ganoine: the posterior elements have sharp grooves in the shiny layer, and these are often so enlarged as to leave small islands of shiny ganoine on the dull bone. This is especially the case on the frontals. The "postfrontal" near the orbital margin has a tubercular and even rugose ornament, the ridges being parallel with that margin. The "antorbital?" shows an intensified continuation of the same ornament, rugose laterally, tubercular mesially. The nasal has a tubercular ornament. The

Fig. 4.



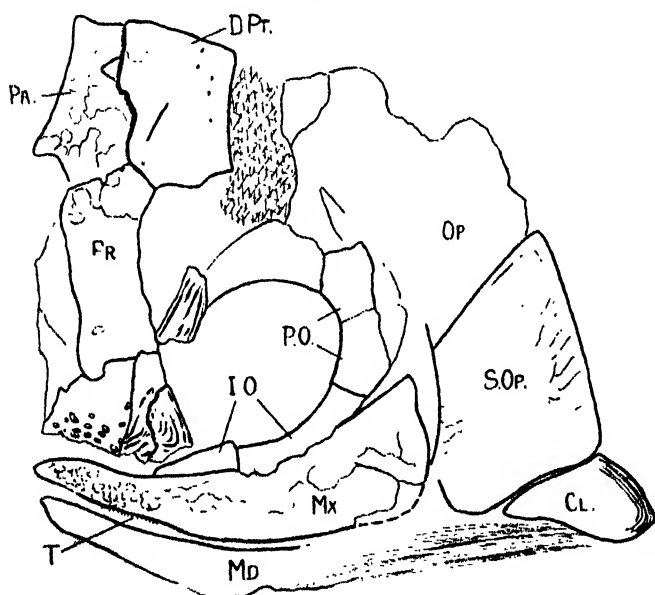
Eduellia blainvillei (Ag.). Skull of specimen in Sorbonne, 19889 b, $\times 7/3$. Skull-roof displaced, beneath pectoral fin.

posterior part of the postrostral has somewhat radially arranged tubercles, while the anterior portion has an extremely heavy tubercular ornament.

The cheek is usually rather badly preserved. There are two postorbitals in contact with the preopercular (figs. 5, 6) and two more elongated infraorbital elements lying over the maxillary. The course of the infraorbital canal through these is occasionally clear (as in British Museum (Natural History) P. 3469 ii). The preopercular must be a narrow elongated element closely following the contour of the back of the orbit. No definite signs

of "suborbitals" can be seen. The maxillary is a rather stout bone, about four times as long as its maximum depth: it is quite shallow, and tapers apparently regularly anteriorly. There is a slight ornament of grooves in the ganoine posteriorly, while the front of the bone shows a somewhat reticulate ornament. The dentition consists of rather numerous but excessively thin and tiny peg-like teeth, to be seen only on the front of the maxillary

Fig. 5.



Aduella blainvillei (Ag.). Skull of specimen in Sorbonne (T. S. W., II., separate head), $\times 3.5$.

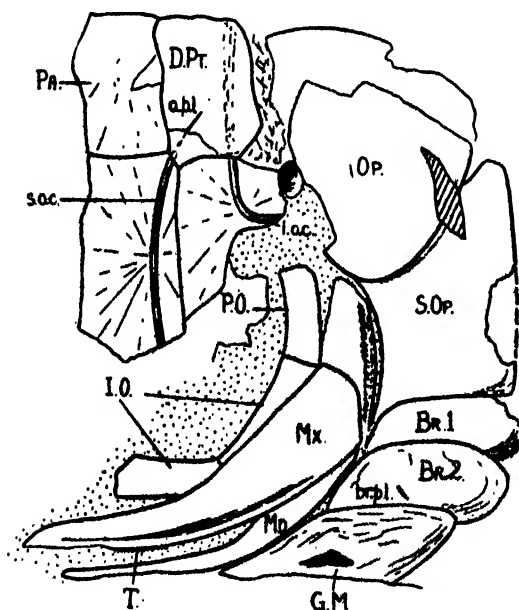
(figs. 5, 6). There is a weak internal flange on the maxillary for the reception of the palate.

The mandible is a slender curved member, of which the structure is obscure (figs. 6, 7). It appears to be slightly shorter than the maxillary, which would thus seem to have met its fellow in symphysis.

The opercular is deeper than wide, and is narrower dorsally than elsewhere. It has a thin ganoine cover,

divided by a few grooves posteriorly (fig. 4). There is often a rather weak ornament of rugæ near and parallel to the anterodorsal margin. The subopercular is somewhat trapezoidal in shape, is overlapped by the opercular, and has a rather stronger ornament of fine grooves. The branchiostegal outfit of the fish consists of only two pairs of broad plates (figs. 2, 6, 7). The more posterolateral pair lies adjacent to the articulation of

Fig. 6.



Eduella blainvillei (Ag.). Skull of specimen in Sorbonne (T. S. W., 1., b), $\times 3.5$.

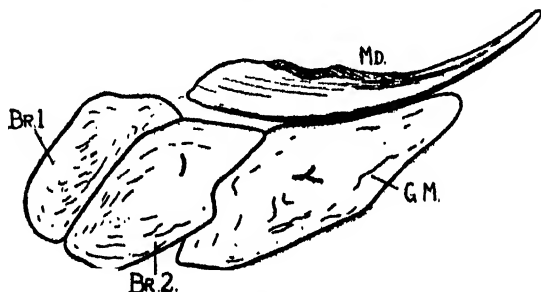
the jaws and overlies the suboperculars; they are overlain by the more anterior elements, each of which bears a pit-line groove. There is a long and narrow median gular element, which bears a Y-shaped pit-line groove and overlies the adjacent branchiostegal elements. Branchiostegals and median gular bear sharp grooves in the ganoine, the ornament being often somewhat irregular, but mostly concentric, in arrangement.

The extrascapular series consists of a number of narrow bones: these are variable in different specimens, and seem to have been formed by more or less random fusion of a number of small elements—perhaps 4 pairs—along the occipital commissure of the lateral-line system, exactly as in *Sinamia* (Stensiö, 1935).

In the material accessible to me there is no sign of ossification of the endocranium. The few traces of palatal bones are so extremely badly preserved as to be unintelligible.

Latero-sensory System of the Head.—The supraorbital sensory canal passes through nasal and frontal in a curve convex mesially; the anterior pit-line passes backwards on to the dermopterotic (figs. 2-6). This course is unique

Fig. 7.



Aduella blainvillei (Ag.). Mandible and branchiostegals, etc., of P.11134a (Brit. Mus., Nat. Hist.), $\times 3.5$.

in Palaeoniscoids, though the posterior end of the supraorbital canal may pass into the dermopterotic in some modern Teleost fishes. The sensory canal itself is rather wide, and is situated deep in the bones: it opens by small pores, difficult to see because of the ornament (fig. 6).

The infraorbital canal traverses infraorbitals and postorbitals, turns backwards in the "postfrontals," and is continued in the dermopterotic.

The occipital cross-commissure certainly traverses the extrascapulars, but has not been prepared.

The preopercular canal has, so far as can be seen, its usual course down the posterior part of the preopercular. The mandibular canal has not been prepared.

The middle and posterior pit-lines form deep grooves on the parietals (figs. 2-6), and the slight variations in their courses will be clear from the figures. Pit-line grooves on the anterior branchiostegals and on the median gular have been mentioned above (figs. 6, 7).

Squamation and Lateral Lines.—The body is covered by smooth ganoine-covered scales; in general each scale strongly overlaps scales in the next posterior row. The anterior flank-scales are about twice as deep as long. The posterior flank-scales are about equilateral; the dorsal and ventral scales become less deep than long. The anterodorsal scales may show a few pits, but otherwise the surface of the scales is usually devoid of ornament, though on several specimens the concentric growth-structure of the scales is visible, and there may be a few faint concentric grooves and ridges. The anterior flank-scales have a pectinated margin; in the middle of the body the pectinations are fewer and confined to the lower part of the posterior margin. The posterior flank-scales may show very feeble pectination or have smooth hinder margins.

The scales are arranged in oblique rows, trending anterodorsal to posteroventral. The position of the caudal inversion varies with the size of the fish (see below); there are 34-39 rows from the shoulder-girdle to the inversion. The various fins arise opposite corresponding scale-rows in most specimens; the variation is apparently normal and modal in each case.

Fin.	No. of scale-row at origin of fin.
Pelvic	7 (rarely 6 or 8).
Dorsal	23 or 24 (rarely 22).
Anal	23 or 24 (rarely 22 or 25).
Caudal	33 or 34 (rarely 35).

The scale-rows are counted in each case along the lateral line from the shoulder-girdle.

The scales of the caudal lobe are elongated rhombs, and extend to the very tip of the fin.

There are enlarged scales in front of the dorsal fin, and a series of caudal ridge-scales of moderate size. There are two or three enlarged scales in front of the caudal fin, and enlarged scales, probably related to the vent, in front of the anal fin.

The microscopical structure of the scales has not been determined.

The main lateral line opens rather irregularly every second or third scale; there are usually 15 lunate pores. There is a short dorsal lateral line opening in the same manner in the four or fifth scale above the main lateral line.

Median Fins.—The dorsal fin is large and triangular, with enlarged pointed ridge-scales. The fin is composed of some 26 rays, transversely articulated, and distally divided into a fringe.

The anal fin is slightly smaller than the dorsal and is similar in structure; it contains 24–25 rays.

The caudal fin is deeply cleft and markedly inequilateral. It consists of about 70 rays, of which about 17 stronger members form the ventral lobe. The articulations of the more posterior rays are oblique even in young specimens. All the fins are provided with long but slender fulcra. The stouter rays of the median fins have a longitudinal groove—their only ornament.

Paired Fins.—The dermal elements of the pectoral girdle are incompletely known. The post-temporal is small and badly preserved in material used in this description. The supracleithrum and dorsal shank of the cleithrum are often present, and have a strong ornament of rugæ parallel to their length. On a specimen from the Sorbonne there is a small triangular, smooth clavicle (fig. 5). The pectoral fins are somewhat fan-shaped: a specimen in the Sorbonne collection (no. 19889 b, fig. 4) shows a small, rounded, scale-covered, lobate base: nevertheless, the fin is fairly broad-based. The fin-web is of moderate size, lying over the lower flank, and consists of about 15 rays, which are all articulated and distally divided.

The pelvic fins are somewhat smaller, consisting of 17–18 closely articulated and distally divided rays.

Growth-changes.—As the material accessible to the writer comprises some 30–40 individuals—many imperfect, it is true—it is of interest to see how far the variation of the material can be correlated with size and age. Wade (1935, p. 27) has published an interesting investigation of a large series of *Brookvalia* (30 to c. 100 mm.), and the writer has made a study (so far unpublished) of some interesting growth-changes in *Palæoniscus*

freieslebeni Ag. from the Marl Slate and Kupferschiefer, already described very partially by Laatsch (1928). The material of "*Amblypterus*" *blainvillei* ranges from about 25 mm. to about 120 mm., with very rare individuals as long as 170 mm.

1. *Ornament of Dermal Bones*.—The ornament described above is usual in fishes 90–120 mm. long. In smaller individuals the "grooves" are often rather wide, while in a 170 mm. individual the ganoine on the head-bones is thick and apparently continuous, the grooves being only superficial.
2. *Pectination of Scales*.—The pectination on the hinder margins of the flank-scales is stronger and is found on more and more posterior scales in larger fishes. The same is true of *Palæoniscus*.
3. *Caudal Inversion*.—The discontinuity of the squamation-pattern marking the turn-up of the caudal lobe is characteristic of Palæoniscoids. In larger individuals of "*A.*" *blainvillei* this inversion is more marked than in small specimens. If the row of scales at the origin of the caudal fin be taken as a datum, the discontinuity begins further behind this row with increasing size, as in the table.

Size of fish in mm.	No. of rows behind origin of caudal (average).
21-30	1
31-40	2
41-50	3+
51-60	4
61-100	4-5
100+	4-5

This suggests that the anterior scales of the caudal lobe tend to be incorporated into the body-scaling. The same phenomenon has been studied in *Palæoniscus*.

4. *Segmentation of Fin-rays*.—The increase in the number of segments in the fin-rays with increasing size was noted by Wade (1935, p. 27) in *Brookvalia*, and has been studied by the writer in *Palæoniscus* and the present fish. It can be established from the two latter that the proximal segments remain of the same length, growing only in breadth and

thickness, and that new segments are added distally. The length of the segments in the proximal third of the first few rays of the different fins in "*A.*" *blainvillei* is as follows:—Pelvics, 0.8 mm.; dorsal, 1.1 mm.; anal, 0.9 mm.; caudal, 1.0 mm. Thus in a young fish the fin-segments appear slender and long, while in a large animal the segments have a squat appearance. Moreover, the articulations are almost transverse in young individuals of "*A.*" *blainvillei*, becoming quite oblique in older fishes.

The dichotomy of the fin-rays is again a matter of interest. The length of the proximal segments being the same, the fin-rays always branch at the same distance from the base as the first branching took place.

These observations on "*A.*" *blainvillei* and *Palæoniscus* allow one to conclude that in the growth of the fin no new fin-rays are added, but the existing fin-rays grow longer and thicker. The lepidotrichia, when formed, do not grow in length, only in breadth and thickness, and the position of a dichotomous branching does not change during the life-history. New lepidotrichia form distally and the new dichotomous branchings of the fin-rays are initiated in the very fringe of the growing fin.

V. DISCUSSION OF CERTAIN FEATURES IN THE ANATOMY.

The presence of a large, completely heterocercal tail suffices to place "*Amblypterus*" *blainvillei* (Ag.) among the Palæoniscoids or some of their immediate derivatives. On the other hand, the cranial characters are startlingly distinct from those of a typical Palæoniscoid, and the whole head has the appearance of belonging to a much higher type.

The remarkable features of the skull may be listed as follows:—

1. It is extraordinarily short, broad and deep.
2. The suspensorium is somewhat forwardly directed.
3. The orbit is particularly large.

4. The preopercular is a narrow, curved, vertically elongated bone.
5. The maxillary, though higher posteriorly than in front, is quite non-Palæoniscoid in character.
6. The mandible is slender.
7. The teeth on mandible and maxillary are very slender and small.
8. There appears to be a pair of bones ("antorbitals?") lying between the nasals and the orbits.
9. The maxillaries, when undisplaced, extend further forwards than the mandibles, and probably met in the mid-line at the front of the snout.
10. The gape has a markedly upward direction.
11. The branchiostegal apparatus consists of a few very large plates.
12. There is no interopercular.
13. The supraorbital sensory canal ends posteriorly as a pit-line overlying the dermopterotic ("supratemporo-intertemporal"), not the parietal as is usual.

Several of these characters are interconnected; thus no. 4 is clearly connected with nos. 2 and 3; it is impossible to have an expanded maxillary under these conditions (cf. no. 5); and the small number of branchiostegal rays can be regarded as dependent on the forward swing of the jaws, etc. The breadth of the head and size of the orbits are doubtless related features, both dependent in part on the size of the eye.

Characters 1, 2, 4, 10, and to some extent 5, are very like Semionotid features, but nos. 6, 7, 9, 11, and 13 are quite special, and preclude any possibility of this fish being a Semionotid ancestor.

Nevertheless, "*A. blainvillei*" provides an interesting demonstration of the possibility of the transition of a Palæoniscoid into a Semionotid-like condition. "*A. blainvillei*" could have been derived from a normal Palæoniscoid by considerable forward movement of the suspensorium: this might be expected to give rise to characters 4, 5, 10, and 11 in a fish of small size with large eyes. Moreover, the wide gape of a normal Palæoniscoid is usually regarded as connected with the feeding habits, and so with the dentition. Hence the feature no. 7

(smallness of teeth) can be easily understood, as "*A.* *blainvillei*" has certainly modified its habits from those of the presumed ancestral Palæoniscoid. Character no. 8 is possibly, and no. 12 is certainly, primitive.

A Palæoniscoid modified in a somewhat similar manner, but without the special characters 7, 11, and 13, would be a good stage in the evolution of a Semionotid-like fish, as the principal changes necessary would involve only the freeing of the maxillary and the formation of an interopercular. It is clear that "*A. blainvillei*" cannot be expected to throw any direct light on either of these questions, of which the latter only will be mentioned here. Briefly, current opinion on the nature of the interopercular is divided into two main schools: thus Tate Regan holds that the bone is formed by the separate ossification of the antero-ventral corner of the subopercular, while others (Allis, 1909, p. 69, and, recently, Piveteau, 1934, pp. 65, 77) have asserted that it is merely a branchiostegal ray pulled out of the series. Piveteau has described material *Parasemionotus* from the Eo-triassic of Madagascar, in which there seems to be clear evidence of his contention, but there is already a fully-developed interopercular in the Upper Permian *Acentrophorus*. It is, perhaps, worth pointing out that the upper branchiostegal ray in our fish, as in so many Palæoniscids, is directly adjacent to the jaw-articulation, and could possibly be pulled out of series, if attached in any way to that joint, should the suspensorium swing further forwards. It is a well-known fact that the interopercular is often attached by a ligament to the region of the articulation in modern fishes.

There is one other feature about "*A.* *blainvillei*" that is unlike a Semionotid character. The maxillaries appear, in our fish, to meet in symphysis below the snout: they are certainly longer than, and overhang, the mandibles. It is, of course, a matter of the utmost difficulty to be sure of the structure of the snout in almost any fossil fish, and future work may modify or completely disprove the suggestions made here. In our fish, however, there is no sign of any premaxillary element. The writer has been able to study this point in a few Palæoniscids of "normal" type (*Palæoniscus*, *Nematoptychius*, etc.), and in some of these the maxillaries

probably met, or nearly met, in the mid-line. In these fishes the bone usually called premaxillary is associated with the ethmoid commissure, and may or may not bear teeth. The conditions thus resemble, to a certain extent, those shown by the writer (Westoll, 1936 a) to apply in Osteolepids and in primitive Tetrapods: here a pair of bones is associated with the ethmoid commissure and bears teeth. The Palæoniscoid type mentioned above (if it should be proved correct by discovery of very favourable material) would thus be intelligible, but it is not clear in that case how we are to explain the premaxillary bone found in "higher Ganoids" and in Teleosts. In a few recent fishes (e. g. *Polypterus*, which is an interesting case, as Goodrich has shown that it is almost certainly a practically direct Palæoniscoid derivative) the premaxillary is actually a lateral-line bone. Often, however, in Mesozoic fossils, it has been figured as a bone distinct from rostral elements bearing the ethmoid commissure: this is the case also in Watson's figure of *Cheirolepis* (1925), but the writer thinks that the evidence in this fish can be read in other ways. Only palæontological evidence can settle the problem of the origin of the premaxillary, and this region is almost invariably the worst preserved. It is clear, however, that nothing resembling the very complex premaxillary of "Holosteans" and Teleosts is preserved in Palæoniscoids, and it is, perhaps, not altogether improbable that the bone is a neomorph in higher fishes. In a Palæoniscoid the marginal and palatal teeth were firmly held, and the maxillary gave considerable support to the palate. In the "higher" fishes the maxillary has become free, and only then do we find a complex premaxillary, possibly connected with a new functional importance of the ethmoid region. The homologue of this bone in earlier types is not yet clear: a few possibilities are given below.

1. The premaxillary of "higher fishes is an entirely new formation.
2. The rostral of the Palæoniscoid has become divided into two components, one still associated with the lateral line, the other related to the marginal teeth. The latter has become intimately associ-

ated with the surrounding structures. A similar division of other lateral-line bones into membrane and canal components is a parallel change.

3. The maxillary of the early fishes has given rise to two parts by "fragmentation": an anterior part, the "premaxillary" of higher fishes, and a posterior "maxillary." It is noteworthy that in Holosteans and really primitive Teleosts the "maxillary" and "premaxillary" are both marginal elements and lie in the same line: only in the advanced Teleosts do the bones have other relationships.
4. The ancestors of the "higher Ganoids" and Teleosts were distinct from the Palæoniscoids from very early times. If this is true, the development of bone in the two groups may have been independent. This is very improbable.

The detailed structure of many representative Palæoniscoids and Mesozoic fishes must be known before the homology of the snout elements is clear. But it is very probable that the premaxillary of the Teleosts and "higher" bony fishes is not homologous with that of the Choanata, which is a dentigerous rostral.

One feature of "*A.*" *blainvillei* that needs comment is the course of the anterior pit-line. In normal Palæoniscoids the supraorbital sensory canal passes backwards as the anterior pit-line: usually the posterior end of the enclosed portion of the canal enters the parietal, and the pit-line is short. In some forms the pit-line is longer and the canal proper is shorter. In "*A.*" *blainvillei* the canal does not pass behind the frontal, and the anterior pit-line invariably passes on to the dermopterotic. The bones of the back of the skull are in no way unusual, however, and it seems unlikely that any component associated with the anterior pit-line has fused with the dermopterotic. In a primitive Palæoniscid the parietal seems to have been formed in relation to a few latero-sensory organs of the posterior part of the supraorbital canal. With the gradual reduction of these organs to the comparatively unimportant pit-organ state, the stimulus for bone-growth was probably removed: if the bone had some important functional rôle it might survive,

otherwise it would tend to be lost. Examples of this loss will be dealt with in another place. "*A.*" *blainvillei* provides us with a case in which the bones had probably an important protective function: the broad cranium had probably a wide posterior fontanelle. A more interesting feature in our fish concerns the change in course of a pit-line from one bone to another. Current research on dermal bones seems to show clearly that certain elements have a constant relationship to sensory canals; it is probable that this invariable relationship is connected with the comparatively deeply infolded organs of the sensory canals proper. When the sensory organs remain superficial it is the writer's experience that the resulting "pit-lines" have very variable courses with respect to the underlying bones. The first bone to involve the nerve-supply of the pit-line will "anchor" that line to it, and this idea adequately explains the conditions in "*A.*" *blainvillei* and in many other fishes.

RELATIONSHIPS.

It is clear from the foregoing that "*A.*" *blainvillei* differs from any Palæoniscoid so far described, and it is necessary to erect a new genus for its reception. The name *Æduella* *, gen. nov., is here proposed for it, and the genus may be defined as follows:—

Fishes of small size, stoutly fusiform. The head is short and extremely broad, with large orbits and no rostral projection: the skull-roof with a very large "postfrontal" and an "antorbital?", the anterior pit-line groove on the dermopterotic. The cheek is narrow, the preopercular curved behind the eye, and the suspensorium somewhat forwardly directed. The maxillary is low, tapering gradually, probably meeting its fellow below the snout. The mandible is shallow. The dentition is weak, consisting of tiny cylindrical or conical teeth. Opercular much deeper than wide, subopercular rather trapezoidal in shape. The branchiostegal rays are very broad and two in number; there is an elongated median gular. Ornament of head-bones consisting mostly of grooves in the ganoine: above the orbit and

* Derived from the name of the people, the *Ædui*, whose capital was moved from Bibracte to Augustodunum (Autun) by Augustus,

on the snout there is a development of strong rugæ and tubercles.

Dermal shoulder-girdle incompletely known: clavicle probably present. Pectorals with small lobate base. Pelvics rather nearer to pectorals than to anal. Dorsal large and triangular, with a few large ridge-scales; opposite gap between anal and pelvics, slightly overlapping the former. Anal rather smaller, slightly nearer to caudal than to pelvics. Caudal fin large, completely heterocercal, markedly inæquilobate; pedicle stout.

Squamation practically devoid of ornament, with thick ganoine. Hinder margins of anterior scales pectinated.

Lateral-line opening by lunate pores every second or third scale, a short dorsal lateral line opening similarly.

The relationship of *Aduella* now calls for discussion. The numerous species recognized by Sauvage from Autun will not be considered, for reasons already stated. The writer's attention was drawn by a note, in vol. iii. of Smith Woodward's invaluable Catalogue (p. 127) dealing with *Lepidopterus crassus* Pohlig, described by Pohlig as a link between *Amblypterus* and the Semionotidæ. In the supplement to this catalogue, kept in MS. in an interleaved copy in the British Museum (Natural History) is a note by Smith Woodward as follows: "Type of *Lepidopterus crassus* from Friedrichroda in the Halle Museum seems to be *Amblypterus arcuatus*, as labelled by K. von Fritsch. A. S. W., May 10th, 1897." I am indebted to Sir Arthur Smith Woodward for the privilege of quoting this note, and to Dr. E. I. White for allowing me to see the interleaved catalogue. Fortunately there are in the British Museum the type of *Amblypterus arcuatus* and two fishes from Friedrichroda labelled "*Amblypterus (Lepidopterus) crassus* Pohlig, Rotliegende, Goldlauter Schichten. Gottlob Friedrichroda, Thuringia" (P.15094-5); the two latter agree well with Pohlig's description, and differ considerably from *A. arcuatus*, which has a normal Palæoniscoid cheek, though the suspensorium is not very oblique. *Lepidopterus crassus* is a fairly large fish, attaining a length of at least 25 cm. The preservation of the material is not good, and any full description would be out of place. The skull-roof is almost undecipherable,

but the cheek shows that the suspensorium is vertical or a little forwardly inclined, and that the maxillary, deeper posteriorly than beneath the eye, lacks the typical cheek-expansion of Palæoniscids and resembles somewhat the maxillary of *Æduella*. The teeth are apparently always small, described by Pohlig as a brush-like margin to the jaw. The mandible is shallow. The opercular system is partly shown in the material studied: it resembles that of *Æduella* in having few branchiostegal rays and in the general shape of the elements: the subopercular, however, is shallower than in that genus. The course of the sensory canals in the head-bones cannot be determined.

The fins of *Lepidopterus crassus* seem to be proportionally somewhat larger than those of *Æduella* with the exception of the tail-fin, the ventral lobe of which is shorter in proportion. The pelvic fins of *Lepidopterus* are situated further forwards in proportion to those of *Æduella*. The squamation is not very regularly preserved: the scales are smooth, and there may be about 40 rows to the caudal inversion: in P.15095 it is possible to estimate the position of the fins with reference to the scale-rows:

V. 11; D. 31; A. 28; C. 37, as against

V. 7; D. 23-24; A. 23-24; C. 33-34 in *Æduella*.

The most notable features thus brought out are the greater numbers of scales in *Lepidopterus*: the origin of the dorsal three scale-rows behind the anal, which, as the relative position of the fins on the body is not very different in the two forms, suggests that the scale-rows are more oblique in *Lepidopterus*.

In short, while there is good evidence that *Lepidopterus* is generically distinct from *Æduella*, it may be fairly closely related to that fish, and only the study of better specimens can settle that question. For the moment it is better to disregard it in discussion.

The writer has examined many other species of "*Amblypterus*" and has found considerable diversity of structure; but no other species seen so far resemble *Æduella* in essential anatomical features. It is therefore necessary to look outside the genus "*Amblypterus*" for relatives of our fish. It is clear now that the old

group of "Palæoniscidæ" is extremely complex and includes many phyletic lines, often characterized by peculiarities of skull-structure; but of all "Palæoniscids" so far described only *Canobius* and *Eurylepis* have any marked resemblance to our fish in essential features.

Canobius is represented by a number of species from the Lower Carboniferous of Scotland. Traquair distinguished a group (" *Mesopoma* ") in which the cheek-bones have a typically Palæoniscid arrangement. Of the rest, *C. ramsayi* and others share with *Aduella* characters nos. 1, 2, 3, 4, 6, 9 (?), 11, and 12: the maxillary is still expanded posteriorly. A cheek of this genus has been diagrammatically figured by the writer (1937, fig. 6 c). These fishes have a normal course of the supraorbital canal and anterior pit-line on to the parietal. The type of ornament in *Canobius* is different from that in *Aduella*.

Eurylepis Newb. occurs in the Pennsylvanian of Linton, Ohio, and in the Coal-Measures of England. Its structure will be more fully described by the writer elsewhere; it may be noted here that characters nos. 1, 2, 3, 4, 5 (in part), 6, 7, 9, 11, and 12 are found in *Eurylepis*. In addition there is good evidence that the parietal may disappear, and that the anterior pit-line may then pass back on to the dermopterotics. The ornament of the bones has a certain resemblance to that in *Aduella*. *Eurylepis*, however, is very specialized in scales and fins, and cannot be ancestral to our fish*.

The small fish *Pyritocephalus* Fritsch, from the Gas-Coal of Bohemia, has also a somewhat forwardly-directed suspensorium, but the cranial roof is so remarkably specialized that this genus can have no immediate relationship with *Aduella*. Its structure will be discussed at the same time as that of *Eurylepis*.

Hence neither *Eurylepis* nor *Pyritocephalus* can be directly ancestral to our fish, and *Eurylepis* is in many ways like *Canobius*. It is possible, therefore, that *Canobius* is not ancestral to *Aduella*, though in many

* The small fish from the Wichita Formation described as *Eury-lepidoides socialis* by E. C. Case (1935) has apparently a more normal Palæoniscid structure, and is not related at all closely to *Eurylepis*. The row of very deep lateral-line scales occurs in other Palæoniscids—e. g. *Rhadinichthys hancocki* (Atthey).

ways it seems to afford a morphological type from which all these later genera could be derived. Full discussion of this matter must await publication of the structures of the other fishes mentioned. It is not unlikely, however, that *Canobius*, *Eurylepis*, *Pyritocephalus*, *Aduella*, and, perhaps, other Permian and pre-Permian fishes, including the Semionotidæ, may have developed forwardly directed suspensoria quite independently of one another. All these fishes are small, and the eye is apt to be large in a small fish: thus characters 1, 2, 3, 4, and 10 would follow almost automatically, and there would be a tendency to acquire features nos. 5 and 11 as well. The whole process would probably be correlated with a change in feeding-habits, and thus with the abandonment of the wide "Palæoniscid" gape. The possibility of independent change in a number of lines from a "Palæoniscid" to a "Holostean" type of skull cannot be dismissed.

VII. SUMMARY.

The structure and relationships of the small fish *Amblypterus blainvillei* Ag. from the Lower Permian of Muse, near Autun, are discussed. The main cranial features are: the broad head, the lack of any rostral projection, the large orbit; the forwardly-directed suspensorium, the curved and narrow preopercular; the shallow maxillary, without a broad cheek-expansion, probably meeting its fellow below the snout; the slender mandible, and the minute conical or cylindrical teeth; the presence of only two pairs of broad branchiostegals and a long median gular. The latero-sensory canal system is embedded in the bones, with the exception of the pit-lines; the anterior pit-line groove lies on the dermopterotic (supratemporo-intertemporal), not on the parietal as usual. The squamation is regular, the scales usually without ornament; the anterior scales of the caudal lobe are probably incorporated into the body squamation during life. Fins of moderate size: caudal deeply cleft, inequilobate, completely heterocercal: dorsal opposite interval between pelvics and anal, slightly overlapping the anal; anal nearer to caudal than to pelvics, pelvics nearer to pectorals than to anal:

pectoral fins with small basal scale-covered lobe. Lateral-line opening by lunate pores: a dorsal lateral line, enclosed in scales and opening in the same way.

The new genus *Aduella* is proposed for the reception of the species.

Growth-changes in the squamation, fins, etc., are described. Certain points in the anatomy of the opercular apparatus, of the rostral region, and of the latero-sensory system of the head are discussed, and the mechanism of the derivation of *Aduella* from a "Palæoniscid" is dealt with.

Finally, the relationship of *Aduella* to other Palæozoic fishes is discussed, with particular reference to the origin of the "Holostean" fishes.

BIBLIOGRAPHY.

- (1) AGASSIZ, L. 1833. Poiss. Foss. vol. ii. pt. i.
- (2) ALLIS, E. P. 1909. "The Cranial Anatomy of the Mail-cheeked Fishes." 'Zoologica,' xxii. p. 69.
- (3) DE BLAINVILLE, H. D. 1818. Nouv. Dict. d'Hist. Nat. vol. xxvii.
- (4) CASE, E. C. 1935. "A new Palæoniscid Fish, *Eurylepidoides socialis*, from the Permo-Carboniferous of Texas." Contrib. Museum of Paleont., Michigan, iv. no. 14. p. 275.
- (5) LAATSCH, W. 1931. "Die Biostratonomie der Ganoidfische des Kupferschiefers." 'Paläobiologica,' Bd. iv. p. 175.
- (6) LANDRIOT, L'ABBE. 1839. "Notice géologique sur la formation des Schistes de Muso." Compto-Rendu Soc. Eduenne, vol. i. p. 122, pl., figs. 1-3.
- (7) PIVETEAU, J. 1934. "Paléontologie de Madagascar.—XXI. Les Poissons du Trias Inférieur. Contribution à l'étude des Actinoptérygiens." 'Annales de Paléontologie,' Tome xxiii. pts. 3 and 4.
- (8) POHLIG, H. 1892. "Altpermische Saurierfährten, Fische und Medusen der Gegend von Friedrichroda." Festschr. 70ten Geburtst. R. Leuckarts, p. 63, pl. vii. fig. 3.
- (9) REGAN, C. TATE. 1929. "Fishes." Encycl. Brit. ed. 14, ix. p. 313.
- (10) SAUVAGE, H. E. 1890. 'Études des Gites Minéraux de la France. Bassin houiller et permien d'Autun et d'Epinac.—Fasc. III. Poissons Fossiles.' Paris.
- (11) —. 1893. *Ibid.*—Fasc. V. Poissons Fossiles. Paris.
- (12) —. 1895. "Note sur quelques *Amblypterus* du Terrain permien d'Autun." Soc. d'Hist. naturelle d'Autun, Bull. viii. pp. 301-307, pl. xii.
- (13) STENSIÖ, E. A. 1935. "*Sinamia zdanskyi*, a new Amiid from the Lower Cretaceous of Shantung, China." Palæont. Sinica, ser. C, vol. iii. Fasc. 1.
- (14) TRAQUAIR, R. H. 1877. "On the Agassizian Genera *Amblypterus*, *Palæoniscus*, *Gyrolepis*, and *Pygopterus*." Q. J. G. S. vol. xxxiii. p. 558.
- (15) WADE, R. T. 1935. "The Triassic Fishes of Brookvale, New South Wales." British Museum, Natural History.

- (16) WATSON, D. M. S. 1925. "The Structure of certain Paleoniscids and the Relationship of that Group with other Bony Fishes." Proc. Zool. Soc. Lond. 1925, pt. iii. p. 815.
- (17) WESTOLL, T. S. 1936. "On the Structure of the Dermal Ethmoid Shield of *Osteolepis*." Geol. Mag. vol. lxxiii. p. 157.
- (18) —. 1937. "On the Cheek-bones of Teleostome Fishes." Journ. Anat. (in the press).
- (19) WOODWARD, A. SMITH. 1891. 'Catalogue of Fossil Fishes in the British Museum, Natural History.—Pt. II.'
- (20) —. 1895. *Ibid.*—Pt. III.

LVIII.—*Entomological Expedition to Abyssinia, 1926–7: Coleoptera, Brenthidæ and Lycidæ.* With Supplement on a new Lycid from the Cameroons. By R. KLEINE (Stettin).

Brenthidæ.

Aus Abyssinien ist nur eine endemische Brenthide bekannt, die Art *Cerobates projectus*. Sie wurde von der Entomologischen Expedition 1926 im Urwald, der vor allem aus *Juniperus* und *Podocarpus* besteht, um 8000 Fuss (etwa 2400 m.) entdeckt und von mir schon 1934 beschrieben. Zur Vervollständigung wird die Beschreibung hier wiederholt.

Die nachstehend genannten Arten der Gattung *Amorphocephalus* wurden von Herrn H. Uhlenhuth nach Abreise der Expedition in trockenerem, weniger hoch gelegenen Gebiet mit ganz anderer Vegetation gefunden. Aussichtsreich würde die Ausbeute an Myrmecophilen sein. Es ist durchaus möglich, dass die im Sudan lebenden Myrmecophilen in Abyssinien vorkommen. Diese Annahme hat ihre Bestätigung zum Teil durch die Ausbeute von Herrn Uhlenhuth gefunden. Von den drei *Amorphocephalus* ist *hospes* eine vom Sudan bis Süd-Afrika überall gemeine Art, die beiden anderen sind vom Sudan und Somali bekannt, das Auffinden in Abyssinien ist daher erklärlich.

CEROBATES Schoenherr.

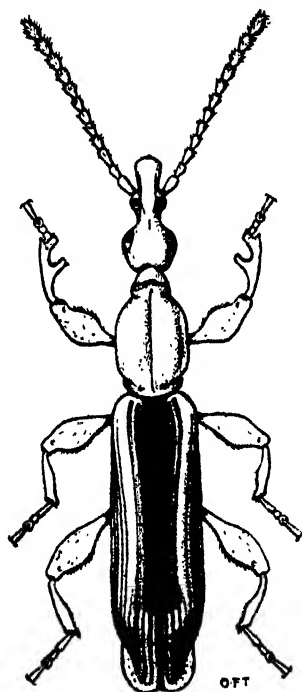
Cerobates projectus Kleine.

Cerobates projectus Kleine, Arb. morph. taxon. Ent. Berlin-Dahlem, i. pp. 301–2, 1934. (Fig. 1.)

Rotbraun, auf den Elytren eine schwarze, an der Basis breit beginnende, sich nach hinten verschmälernde keilförmige Partie, die sowohl an den Seiten wie nach

hinten scharf abgegrenzt ist. Kopf oberseits platt, Hinterrand dreieckig eingekerbt, ungefurcht, ohne Skulptur; Metarostrum nach dem Mesorostrum keilförmig verschmälert, deutlich, wenn auch nur schmal gefurcht; Mesorostrum nicht erweitert, etwas erhaben, ungefurcht; Prorostrum so lang wie das Metarostrum, nach vorn ein wenig erweitert, an der Basis flach eingedrückt, ohne

Fig. 1.

*Cerobates projectum* Kleine, \times ca. 11.5.

Skulptur. 3. Fühlerglied länger als das 2. oder 4., 5.-11. elliptisch, das 11. kaum länger als das 10. Prothorax am Vorder- und Hinterrand verengt, Seiten parallel, Oberseite platt mit durchgehender, tiefer und verhältnismässig breiter Mittelfurche, Skulptur fehlt auf der Oberseite gänzlich, nur über den Hüften finden sich einige deutliche Punkte, an den Rändern werden diese tiefer und gröber und sind zum Teil filzig. Auf den

Elytren sind alle Rippen voll entwickelt, die 3. neben der Sutura doppelt so breit wie die übrigen und abgeflacht. Beine sehr kräftig, Schenkel einzeln punktiert, in den Punkten zum Teil behaart. Metasternum breit gefurcht, 1. und 2. Abdominalsegment breit, muldenförmig vertieft.

Länge 6–8 mm.; Breite (Prothorax) 1–1.25 mm. circa.

Loc. Abyssinia: "Jem-Jem Forest, ca. 8000 feet, 7. x. 1926, from decaying wood, 4 ex. (Scott)."

Typus im Britischen Museum, Cotypus im Deutschen Entomologischen Institut, Berlin-Dahlem. Die Art ist durch die Elytrenfärbung sofort erkennbar und würde sich schon hierdurch leicht und sicher von allen Gattungsgenossen unterscheiden. In meiner *Cerobates*-Tabelle steht sie in Abteilung 3: Prothorax gefurcht und da in der Unterabteilung (17) derjenigen Arten, deren Hinterkopf dreieckig eingekerbt ist*. In dieser Gruppe kann nur ein Vergleich mit *articulosus* Kleine und *costatus* Kleine in Frage kommen. Abgesehen davon, dass es sich in beiden Fällen um Orientalen handelt, ist *projectus* sofort durch die Elytrenzeichnung und die erweiterte Rippe auf den Elytren charakterisiert.

AMORPHOCEPHALUS Schoenherr.

Amorphocephalus hospes Kolbe, 1885.

Loc. Abyssinia: Dire Dawa, ca. 4500 Fuss, v. 1935, 1 ♂ (*Uhlenhuth*). Ueber das ganze Afrika südlich der Sahara, und Südwest Arabien, verbreitet.

Amorphocephalus intermedius Kleine, 1918.

Loc. Gleicher Fundort, v. 1935, 1 ♂ (*Uhlenhuth*). Somali, Sudan, Ostafrika.

Amorphocephalus princeps Kleine, 1918.

Loc. Gleicher Fundort, iii.–v. 1935, 3 ♂, 2 ♀ (*Uhlenhuth*). Sudan. Senegal(?)†.

* "Bestimmungstabelle der Brentidae," Ent. Zeitschr. (Frankfurt), xlii. p. 293, 1929; *ibid.* xliii. p. 11, 1929.

† [This record is based on an old specimen (male) in the British Museum, determined as belonging to this species by Herr Kleine in 1922. The specimen was originally in the Bowring Collection, and bears a label written by H. Jekel, on which "Senegal" is given as the locality, but this must be accepted with reserve.—H. S.]

Lycidae.**LYCINÆ. Tribus LYCINI.**

Die Lycidenfauna Abyssiniens unterscheidet sich von der des tropischen Afrikas nicht.

LYCUS Fabr.

Subgenus **LOPHOLYCUS** Bourgeois, 1883.

Lycus (Lopholycus) standingeri Bourgeois, 1899.

Loc. Abyssinia: "near Addis Alam, ca. 8000 feet, from cultivated country, ix. 1926, 2 ♀ (*Scott, Omer-Cooper*); Jem-Jem Forest, ca. 8000 feet, ix.-x., 1 ♂, 1 ♀, the latter found on yellow "Maskal" flowers * (*Scott*)."

Aus dem tropischen West-Afrika beschrieben. Ich sah die Art noch nicht aus Abyssinien.

Subgenus **LYCUS**, s. str., Bourgeois, 1883.

Lycus (s. str.) *flammeatus* Bourgeois, 1908.

Loc. Abyssinia: "near Addis Alam, ca. 8000 feet, from cultivated country, 18. ix. 1926, 1 ♀ (*Scott*); Jem-Jem Forest, 8000-9000 feet, 21. ix.-4. x. 1926, about 47 ♂ and 54 ♀, many of both sexes (over 50 in all) taken on the yellow "Maskal" flowers (see footnote), others in very dense and shady parts of the forest (*Scott*); Mt. Chillálo, ca. 9000 feet, 12-17. xi. 1926, 2 ♀ (*Scott*)."

Aus Uganda beschrieben. Eine der weitestverbreiteten und variabelsten Arten der ganzen Gattung. Die zahlreichen Männchen und Weibchen aus dem Jem-Jem Forest sind recht variabel in Grösse und Färbung; ein Weibchen davon ist monströs: der Vorderrand des Halschildes ist in der Mitte tief ausgeschnitten. Eine *Lycus*-Larve aus verrottetem Holz vom Jem-Jem Forest dürfte dieser Art angehören.

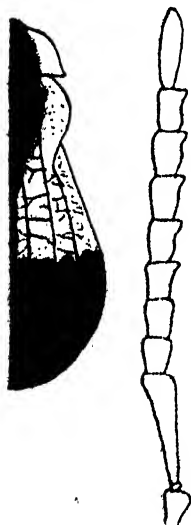
* [The yellow "Maskal" flowers, mentioned under three of the species of *Lycus*, are species of *Coreopsis* and *Guizotia* (Compositæ). They grew in large beds, and at the end of September formed masses of yellow colour at the edges of Jem-Jem Forest. Their native name is derived from their being in full bloom at the time of the Maskal (Holy Cross) festival, about Sept. 28th, and at Jem-Jem in 1926 bunches of the flowers were worn or carried by the country-people at the local celebrations of the feast.—H. S.]

Subgenus *MEROLYCUS* Bourgeois, 1883.

Lycus (Merolycus) scotti, sp. n. (Fig. 2.)

♂. Unterseite des Körpers, Kopf, Beine und Fühler tiefschwarz, hochglänzend, Oberseite lehmgelb, die dunklen Partien sind tiefschwarz (Abbildung 2). Kopf mit gewölbtem Scheitel, Stirn tief, grubig eingedrückt, Rüssel 2-2½ mal so lang wie der Kopf. Fühler, siehe Abbildung 2. Prothorax dreieckig, etwas breiter als hoch, Vorderecken stumpf-gerundet, Seiten stark erhöht. Auf den Elytren mit deutlicher Furchensculptur und feiner, punktartiger Allgemeinsculptur.

Fig. 2.



Lycus (Merolycus) scotti, sp. n.; rechte Körperhälfte (× ca. 5) und Fühler.

♀. Schlanker, sonst mit dem ♂ übereinstimmend.

Länge 10-12 mm.; Breite (hum.) 4 mm., (total) 6 mm.

Loc. Abyssinia: "Jem-Jem Forest, ca. 8000 feet, 22-26. ix. 1926, 2 ♂, 1 ♀, of which the female and one of the males were found on "Maskal" flowers (Scott)."

Typen im Britischen Museum,

Die Art ist dem *Lopholycus staudingeri* ähnlich, ist aber gedrungener und daher auch robuster. Durch den Habitus des ♂ gehört sie aber zu *Merolycus*.

Tribus CLADOPHORINI.

CAUTIRES C. O. Waterhouse, 1879.

Cautires certus Kleine, 1930.

Loc. Abyssinia: Dire Dawa, ca. 4500 feet, ii., v., 1935, 1 ♂, 1 ♀ (*Uhlenhuth*).

Vom Belgischen Congogebiet beschrieben. Die Art ist im ganzen Tropengürtel weit verbreitet, aus Abyssinien aber noch nicht bekannt.

PLANETEROS Gorham, 1883.

Planeteros ochropterus Gorham, 1883.

Loc. Abyssinia: "Jem-Jem Forest, ca. 8000 feet, near "pond no. 2," 26. ix. 1926, 1 ex. (*Omer-Cooper*)."

Die Art ist bisher nur aus Abyssinien bekannt.

Fig. 3.



Lycus (Acantholycus) montiphilus, sp. n.; rechte Körperhälfte.
♂ (links), ♀ (rechts). × ca. 2.3.

ANHANG.

EIN NEUER ACANTHOLYCUS AUS KAMERUN.

LYCUS. Subgenus ACANTHOLYCUS Bourgeois, 1883.

Lycus (Acantholycus) montiphilus, sp. n. (Fig. 3.)

♂. Kleine, zierliche Art. Schwarz, Prothorax an den Seiten und die Elytren lehmgelb, letztere an der Sutura und am Hinterrand schwarz gezeichnet (Abbildung 3). Stirn breit und tief eingedrückt, Rüssel länger

als der Kopf. Fühler kurz, die Glieder nur ganz schwach gezähnt, länger als breit, dicht aneinander sitzend. Prothorax so breit wie hoch, Vorderrand flach abschüssig, Seiten gerade, Hinterecken spitz aber nicht vorgezogen. Elytren in der Humeralgegend, auf der 3. Rippe gedorn, alle Primärrippen deutlich, auch die sekundären und die Furchensculptur erkennbar ausgebildet.

♀. Schlank, in der Ausfärbung dem ♂ ähnlich.

Länge, ♂♀, 8–10 mm.; *Breite* (Hum.) 2 mm., (total) 3 (♀)–6 (♂) mm.

Loc. Kamerun Berg: Musake, 6300 Fuss, 14. i. 1932, 3 ♂, 4 ♀, "on blossom" (*Miss M. Steele*).

Die Variationsbreite scheint gering zu sein. Bei den männlichen Tieren variierte nur der Humeraldorn in Länge und Stärke, bei den weiblichen Tieren waren keine nennenswerten Differenzen vorhanden.

Typus im Britischen Museum, Paratypus in meiner Sammlung.

LIX.—*Some Parasitic Worms from East African Chamæleons*. By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

[Plate XVII.]

THE following is a brief report on some helminths from chamæleons collected by Mr. Arthur Loveridge during an expedition to Kenya, Uganda and Tanganyika Territory. For the privilege of studying the material the writer is indebted to Dr. Thomas Barbour, Director of the Museum of Comparative Zoology, Harvard College, by whom a series of the specimens has been kindly presented to the British Museum (Natural History).

TREMATODA.

Fam. *Allocreadidae*.

Laureriella lateriporus Skrjabin, 1916.

(Pl. XVII. fig. 1.)

This interesting form was originally recorded by Skrjabin (1916) from the intestine of an unnamed species of chamæleon in British East Africa. The present collection

contains specimens from *Chamaeleon fülleborni* (four sets, loc. Nyamwanga, Poroto Mts., Tanganyika Territory) and from *C. bitaeniatus höhnelii* (one set, loc. Sipi, Mt. Elgon, Uganda).

Skrjabin's material was immature, and the largest specimen measured only 6.12 mm. in length and 1.275 mm. in width. All the present specimens are mature and contain eggs. Some of those from *Chamaeleon fülleborni* attain a length of about 15 mm. and a maximum width (at about the level of the ventral sucker) of about 3.5 mm. Some additions and corrections to the original description seem desirable.

The worms vary in length from 5 to 15 mm. Their width varies greatly according to state of contraction. The oral sucker measures 0.42–1.03 mm. in diameter (0.476×0.51 mm.)*, the ventral sucker 0.4–0.9 mm., and the pharynx 0.25–0.7 mm. (0.3 mm.). The greatest diameter of the ovary is 0.3–0.65 mm., and that of the testes (the posterior of which is often larger than the anterior) 0.55–1.5 mm. (0.51–0.54 mm.). The ovary is not median, as stated by Skrjabin, but lies, in all the specimens examined, to the left of the middle line. Skrjabin's observation was confirmed regarding the opening of Laurer's canal on the right lateral margin of the body. The canal passes, however, immediately dorsally to the gut-branch of that side, and not ventrally to it, as shown in Skrjabin's figure.

According to Skrjabin, the vitelline glands are grouped so as to form four longitudinal bands (i. e., two bands on each side, one lateral and one median to the gut-branch of that side). The vitelline glands of each side, as may be seen in sections, actually form a complete investment surrounding the gut-branch on all sides. The two lateral sets of glands are confluent dorsally and ventrally at the posterior end of the body, and are separated only by the excretory bladder in the portion of the body between the posterior extremity and the posterior testis. The appearance described by Skrjabin might perhaps be produced, in a flattened specimen, through the pressing aside of some of the glands by the gut-branches.

An arrangement which is believed to be somewhat unusual was observed in the vitelline ducts. The main

* The measurements in brackets are those given by Skrjabin.

longitudinal ducts of the two sides run back parallel to, and ventrally to, the gut-branches, but not quite as far as their extremities. Instead of remaining separate, as is usual in Trematodes, they form a continuous loop, which passes immediately ventrally to the terminal duct of the excretory bladder. This continuous vitelline duct can be seen in favourable whole preparations, if it is well filled with yolk-cells, but its presence was established beyond doubt by means of serial sections (Pl. XVII. fig. 1, v.) *.

The excretory bladder (Pl. XVII. fig. 1, e.) occupies the median field of the post-testicular region of the body as an elongate sac giving off numerous lateral branches. At its anterior end it forms a system of spacious sinuses at the sides of, between, and dorsally to the testes.

The uterus, in Skrjabin's specimens (which contained no eggs), was relatively short and had comparatively few coils. In older specimens, however, it occupies most of the available space between the anterior testis and the anterior end of the body, extending forward almost to the level of the pharynx. The eggs measure $0.074-0.082 \times 0.04-0.052$ mm.

CESTODA.

Fam. Anoplocephalidæ.

Oochoristica ? *agamæ* Baylis, 1919.

A species of *Oochoristica* occurred in the following hosts :—

Chamæleon fischeri multituberculatus (several times).—Loc.

Phillipshof, Usambara Mts., Tanganyika Territory.

Chamæleon gracilis gracilis (once).—Loc. Bukori, Mt.

Elgon, Kenya Colony.

Chamæleon bitæniatus höhnelii (once).—Loc. Butandiga, Mt. Elgon, Uganda.

* It is not improbable that a similar arrangement of the vitelline ducts may be found to occur generally in the family Allocreadidæ. According to Hopkins (1934) the ducts of the two sides are joined behind the posterior testis in *Crepidostomum* Braun, *Megalogenia* Surber and *Bunodera* Raill. In serial sections of *Crepidostomum farionis* (Müll.) the writer has observed what appeared to be a large sinus connecting the lateral ducts and occupying a great part of the space between the posterior testis and the hinder end of the body. The appearance of a continuous posterior loop was also observed in a favourable whole preparation of *Helicometra pulchella* (Rud.).

Most of the specimens are fragmentary, and none of them are in very good condition. They seem, however, possibly to be referable to *O. agamæ*. This species was originally described from *Agama* sp. in East Africa. Meggitt (1926) has recorded it from *Hemidactylus gleadowii* in Burma and (1927) from *Agama* sp., "*Dendropus*" [*Dendrophis*] sp. and *Cerastes vipera* in Egypt. In the same Egyptian collection there were also specimens, not mentioned in his report, but determined by Meggitt as *O. agamæ*, from *Psammophis sibilans*. Dollfus (1932) records *O. agamæ* from *Agama inermis* in the Sahara, while the present writer has referred to this species specimens from *Agama hispida armata* in Portuguese East Africa (Cott, 1934, p. 149). Thus, although *O. agamæ* has not previously been recorded from chamæleons, it seems to have a considerable number of hosts among Lacertilia and Ophidia*. The only species of *Oochoristica* hitherto recorded from Chamæleons appears to be *O. theileri* Fuhrmann, 1924. This was first described from *Agama hispida* (?) in the Transvaal, but has been recorded by Baer (1933) from *Chamæleon tempeli* in Tanganyika Territory †.

Fam. Mesocestoididæ.

Mesocestoides sp. (?).

In the body-cavity of a *Chamæleon fischeri multituberculatus* (loc. Phillipshof, Usambara Mts., Tanganyika Territory) there occurred a large number of plerocercoid larvæ of the "Tetrathyridium" ("Dithyridium") type. These larvæ measure (in Canada balsam) about 1.1–2.5 mm. in length and from 0.7 to nearly 1 mm. in maximum breadth. At the end of the invaginated "neck" there are four rudiments of suckers, not yet in a very advanced state of development in the specimens examined.

A number of similar, but smaller, larvæ occurred in the substance of the liver of a *Chamæleon dilepis roperi*

* Meggitt has recently (1934) suggested that *O. agamæ*, *O. brasiliensis* Fuhrmann and *O. brasiliensis* Fuhrmann are all synonyms of *O. ameiva* (Beddard, 1914). If this view were substantiated, not only would the host-list be increased, but the geographical distribution of the species would be extended to include South America.

† Meggitt (1934) regards *O. theileri* as a synonym of *O. trachysauri* (MacCallum, 1921). The redescription of this Australian species by Johnston (1933) does not seem to support this view.

at Kibwezi, Kenya Colony. These measure about 0.65–0.9 mm. in length and 0.5–0.7 mm. in maximum breadth. The suckers are larger and further advanced in development than in the other specimens.

Larvæ of this type have been recorded on numerous occasions from lizards and snakes (besides mammals and birds), but, so far as the writer is aware, none have yet been found in chamæleons. The larvæ can be specifically determined only by the experimental feeding of suitable hosts (carnivorous mammals and birds) in order to obtain the adult form. In the few cases in which this has been accomplished, it has been shown that (as had been suspected on morphological grounds) the adult form is a species of *Mesocestoides*. A list of recorded "Tetrathyridia," with their hosts, has been given by Witenberg (1934).

NEMATODA.

Fam. Heterakidæ.

Strongyluris media Harwood, 1935.

This species is the most abundant in the collection. It was described by Harwood from "*Chamæleon multituberculata*" from East Africa, his material being in the collection of the Museum of Comparative Zoology, Harvard College, and having, therefore, probably been obtained by Mr. Loveridge.

In the present collection it was obtained on numerous occasions from the following hosts and localities:—

Chamæleon fischeri multituberculatus.—Loc. Phillipshof, Usambara Mts., Tanganyika Territory.

Chamæleon fulleborni.—Loc. Nyamwanga, Poroto Mts., Tanganyika Territory.

Chamæleon bitseniatus höhnelii.—Loc. Butandiga and Sipi, Mt. Elgon, Uganda.

Chamæleon goetzei.—Loc. Ilolo, Rungwe district, Tanganyika Territory.

Chamæleon tempeli.—Loc. Madehani, Ukinga Mts., Tanganyika Territory.

Africana acuticeps (Geddoelst, 1916).

Specimens which are assigned to this species were obtained on three occasions from *Chamæleon gracilis*

gracilis at localities on Mt. Elgon (Bukori, Kenya Colony, and Lukungu, Uganda). In two cases a single female only was collected; in the third a male and two females. The species is recorded by Geddes from *Chamæleon gracilis* and *C. dilepis* in the Belgian Congo.

Fam. Rhabditiidæ.

Rhabdias chamæleonis (Skrjabin, 1916) Semenow, 1929.

Syn. *Angiostrongylus chamæleonis* Skrjabin, 1916; *Entomelas chamæleonis* Travassos, 1930.

This species was originally described from the lungs of an undetermined species of chamæleon in British East Africa. Specimens agreeing with Skrjabin's description were collected on numerous occasions from the following hosts:—

Chamæleon fischeri multituberculatus.—Loc. Phillipshof, Usambara Mts., Tanganyika Territory.

Chamæleon bitæniatus höhnelii.—Loc. Butandiga and Sipi, Mt. Elgon, Uganda.

Chamæleon bitæniatus bitæniatus.—Loc. Kaimosi, Kakamega forest, Kenya Colony.

Chamæleon goetzei.—Loc. Iloilo, Rungwe district, Tanganyika Territory.

Chamæleon fülleborni.—Loc. Nyamwanga, Poroto Mts., Tanganyika Territory.

Chamæleon tempeli.—Loc. Madehani, Ukinga Mts., Tanganyika Territory.

Travassos (1930) has referred this species to a new genus *Entomelas*, together with *R. entomelas* (Duj., 1845) (genotype) and *R. dujardini* (Maupas, in Seurat, 1916). The genus *Entomelas* appears to be differentiated by Travassos from *Rhabdias* Stiles and Hassall, 1905, almost solely by the higher degree of development of the buccal capsule. The buccal capsule of *R. chamæleonis* is relatively small and feebly developed compared with those of *R. entomelas* and *R. dujardini*. Moreover, a feature of these two species (not mentioned by Travassos in his generic diagnosis) is the presence of teeth—three in *R. dujardini*, 6 (or 3 bifid) in *R. entomelas*—at the entrance into the oesophagus. These teeth, if present at all, are extremely insignificant in *R. chamæleonis*,

and if the genus *Entomelas* is to be retained, this species seems to belong rather to the genus *Rhabdias* *.

Fam. Spiruridae.

Physaloptera ortleppi Sandground, 1928.

(Pl. XVII. figs. 2 & 3.)

This species was first recorded by Sandground (1928) from *Chamaeleon dilepis dilepis* at Dodoma, Tanganyika Territory. Subsequently the writer (1929) recorded it from *Chamaeleon deremensis* in the Usambara Mountains, Tanganyika Territory. The present collection contains specimens agreeing with Sandground's description from *Chamaeleon fischeri multituberculatus* at Phillipshof, Usambara Mountains. Other specimens, from *Chamaeleon gracilis gracilis* and *C. senegalensis*, taken at Bukori, Mt. Elgon, Kenya Colony, appear to agree with the description of *P. ortleppi* in almost all respects, but differ from the typical specimens in producing smooth-shelled instead of spiny-shelled eggs.

Mr. H. W. Parker informs me that the known range of *Chamaeleon fischeri multituberculatus* and *C. deremensis* is confined to the Usambara Mountains, Tanganyika, whereas *C. gracilis*, *C. senegalensis* and *C. dilepis* are species of wide distribution in Africa. So far as is known at present, therefore, the typical form of *Physaloptera ortleppi* occurs only in Tanganyika Territory. It is questionable whether the form with smooth-shelled eggs should be regarded as distinct, specifically or subspecifically, from this, but provisionally it is proposed to treat it as a subspecies, which may be called *Physaloptera ortleppi laevis*, while the typical form may be called *P. ortleppi ortleppi* †.

Sandground describes the eggs of the typical form as "covered with minute straggling spines," and gives a figure of an egg which appears to be thickly covered with fine, hair-like processes. In the specimens seen

* In the event of the genus *Entomelas* being reduced to a synonym of *Rhabdias*, the name of the species *Rhabdias entomelas* (Leidy, 1851) would become a homonym of *E. entomelas* (Dujardin, 1845), and would have to be changed.

† A female specimen taken from *Chamaeleon dilepis* at Kilosa, Tanganyika Territory, was formerly doubtfully referred by the writer to *Physaloptera varani* Parona, and was recorded under this name by Loveridge (1924). This specimen is probably referable to *P. ortleppi*, but is without fully-formed eggs.

by the writer (Pl. XVII. fig. 2) the "spines" present a rather different appearance, and might be described rather as more or less conical knobs, irregularly and not very thickly scattered over the shell, and varying considerably in size. The shells of the eggs are quite smooth when first formed, in the more distal portions of the uterine branches, and spines only appear upon those which are nearer to the vagina, or in it, and therefore ready for laying. The eggs with recently-formed, smooth shells are embedded, within the uterus, in a mass of granular material, and appearances suggest that ultimately a thin external coat, raised here and there into knobs, is deposited on the shells by this granular material.

A further point in which the original description may be amplified concerns the armature of the lips. According to Sandground, "the outline of the lips at their internal bases is finely denticulated, but the size of these denticles, all of which are approximately equal, is such that their enumeration with accuracy is not possible. Each lip also bears a simple conical tooth mammillated at its apex." The writer finds (Pl. XVII. fig. 3) that there is, as in many species of *Physaloptera*, a thin, flattened tooth (sometimes bifid) on the inner surface of the conical external tooth, and also, near the dorsal and ventral angles of each lip, two fairly prominent bifid teeth, similar to those found in *Physaloptera paradoxa* and other species. In the space between each of these and the median lateral tooth there are about six denticles, gradually increasing in size from the median tooth outwards. Further series of relatively large denticles extend from the dorsal and ventral bifid teeth to the angles of the mouth. A very small lateral papilla, or lateral organ, is present on the outer surface of each lip, between the subdorsal and subventral papillæ mentioned by Sandground.

Physaloptera sp.

On two occasions specimens of a species of *Physaloptera* differing from *P. ortleppi* were obtained from *Chamæleon bitseaniatus bitseaniatus* at Kaimosi, Kakamega forest, Kenya Colony. In one instance a single male was collected, and in the other a single female without fully-formed eggs. The worm appears to be closely related to *P. pallaryi* Seurat, 1917, and *P. amaniensis* Sandground, 1928, both parasites of *Agama*. The spicules of the male

are short and subequal, and the uterus of the female appears to have four branches.

Undetermined Spirurids.

(a) A single female and a fragment of another specimen of what may be a species of *Protospirura* were obtained from the intestine of *Chamaeleon dilepis roperi* at Voi, Kenya Colony.

(b) Two larvæ, apparently of a species of *Spirura*, were collected from the intestine of *C. goetzei* at Iloilo, Tanganyika Territory (possibly an accidental infection).

Fam. Filariidæ.

Microfilaria.

Portions of the livers of two specimens of *Chamaeleon fülleborni* from Nyamwanga, Tanganyika Territory, were sectioned because of the presence of the nodules referred to below, and the liver of one of them was found to contain a large number of microfilariae. The nodules were so numerous that there was very little comparatively normal liver-tissue. This was somewhat congested with blood, and it was in the blood-vessels, or in lacunæ containing blood, that most of the microfilariae lay. Some, however, appeared to have escaped, probably with extravasated blood, into the surrounding tissue. It is impossible to form any opinion as to the identity of the parent worm, since the collection contained no adult Filariid.

Undetermined Nematode larva.

The livers of several chamaeleons (*C. fülleborni*, *C. templei*, *C. gracilis gracilis*, *C. biteniatus höhneltii*) contained relatively large nodules, probably of parasitic origin. On teasing or sectioning, however, no worms were found in them, except in one nodule from *C. gracilis gracilis* (loc. Bukori, Kenya Colony), sections of which showed the presence of a Nematode larva.

REFERENCES.

- BAER, J. G. 1933. "Contribution à l'étude de la Faune helminthologique africaine." Rev. Suisse Zool. xl. pp. 31-84, pls. i., ii.
BAYLIS, H. A. 1919. "On two new Species of the Cestode Genus *Oochoristica* from Lizards." Parasitol. xi. pp. 405-414, pl. xxi.

- BAYLIS, H. A. 1929. "Some Parasitic Nematodes from the Uluguru and Usambara Mountains, Tanganyika Territory." *Ann. & Mag. Nat. Hist.* (10) iv. pp. 372-381.
- COTT, H. B. 1934. "The Zoological Society's Expedition to the Zambesi, 1927.—No. 5. On a Collection of Lizards, &c." *Proc. Zool. Soc. Lond.* pt. i. pp. 145-173, pls. i.-iii.
- DOLLFUS, R. PH. 1932. "Mission saharienne Augiéras Draper, 1927-1928.—Cestodes de Reptiles." *Bull. Mus. Hist. nat.*, Paris, iv. pp. 539-554.
- FUHRMANN, O. 1924. "Two new Species of Reptilian Cestodes." *Ann. Trop. Med. & Parasitol.*, Liverpool, xviii. pp. 505-513.
- GEDOELST, J. 1916. "Notes sur la Faune parasitaire du Congo belge." *Rev. Zool. Africaine*, Brussels, v. pp. 1-90.
- HARWOOD, P. D. 1935. "Notes on Tennessee Helminths.—II. Two new Species of *Strongyluris* (Nematoda) and Notes on the Genus." *Journ. Tennessee Acad. Sci.* x. pp. 131-141.
- HOPKINS, S. H. 1934. "The Papillose Allocreadiidae. A Study of their Morphology, Life Histories, and Relationships." *Univ. Illinois Bull.* xxxii. pp. 47-124 (Illinois Biol. Monogr. xiii. 2).
- JOHNSTON, T. H. 1932. "The Parasites of the 'Stumpy-tail' Lizard, *Trachysaurus rugosus*." *Trans. & Proc. Roy. Soc. S. Australia*, Adelaide, lvi. pp. 62-70.
- LOVERIDGE, A. 1924. "Notes on East African Lizards collected 1920-1923, &c." *Proc. Zool. Soc. Lond.* pp. 935-969.
- MEGGITT, F. J. 1926. "On a Collection of Burmese Cestodes." *Parasitol.* xviii. pp. 230-237, pl. x.
- . 1927. "Report on a Collection of Cestoda, mainly from Egypt.—Part I. Families Anoplocephalidae, Davaineidae." *Parasitol.* xix. pp. 314-327.
- . 1934. "On some Tapeworms from the Bullsnake (*Pityopsis sayi*), with Remarks on the Species of the Genus *Oochoristica* (Cestoda)." *Journ. Parasitol.* xx. pp. 181-189.
- SANDGROUND, J. H. 1928. "Some new Cestode and Nematode Parasites from Tanganyika Territory." *Proc. Boston Soc. Nat. Hist.* xxxix. pp. 131-150, pls. xvi.-xxi.
- SEMENOW, W. D. 1929. "Eine neue Nematodenart—*Rhabdias microoris*, n. sp.—aus den Lungen von Amphibien." *Centralbl. f. Bakt. &c. Abt. i. Orig.* cxiv. pp. 533-539.
- SEURAT, L. G. 1917. "Physaloptères des Reptiles du Nord-africain." *Compt. rend. Soc. Biol., Paris*, lxxx. pp. 43-52.
- SERJABIN, K. I. 1916. "Parasitic Trematodes and Nematodes, &c." *Scientific Results of the Zoological Exp. to Brit. E. Africa and Uganda made by Prof. V. Dogiel and I. Sokolow in the Year 1914.* Petrograd, vol. i. no. 4. Russian, pp. 1-98. English translation, pp. 99-157, pls. i.-x.
- TRAVASSOS, L. 1930. "Pesquisas helmintológicas realizadas em Hamburgo.—VII. Notas sobre os Rhabdiasoidea Railliet, 1916 (Nematoda)." *Mém. Inst. Oswaldo Cruz, Rio de Janeiro*, xxiv. pp. 161-181, pls. li.-lvii.
- WITENBERG, G. 1934. "Studies on the Cestode Genus *Mesocostoides*." *Arch. Zool. Ital.* xx. pp. 467-508.

EXPLANATION OF PLATE XVII.

- Fig. 1. *Laureriella lateriporus*. Photomicrograph of a horizontal section through posterior end of body (\times about 50). e., excretory bladder; v., vitelline duct.
- Fig. 2. *Physaloptera ortleppi ortleppi*. Egg from uterus.
- Fig. 3. *Physaloptera ortleppi ortleppi*. Anterior end of female, apical view (slightly lateral).

LX.—On a Collection of Diptera from East Greenland.

By J. E. COLLIN, F.E.S.

THE specimens listed below were collected by Mr. F. S. Chapman in Lake Fjord and by Mr. D. Lack in Scoresby Sound (Hurry Inlet and Rosenvinge Bay), with a few at Cape Dalton, all in 1933*. All are now in the British Museum:—

Family, genus, and species.	♂.	♀.	Locality.	Date (all 1933).
EMPIDIDÆ.				
<i>Rhamphomyia flicauda</i> Lundb.	1	..	Hurry Inlet.	4-14. 8.
— <i>hirtula</i> Ztt.	1	1	Lake Fjord.	29. 7.
— <i>nigrita</i> Ztt.	4	2	Hurry Inlet.	4-14. 8.
<i>Hydrodromia stagnalis</i> Hal. . . . .	..	1	Hurry Inlet.	4-16. 8.
DOLICHOPODIDÆ.				
<i>Dolichopus granlandicus</i> Ztt.	5	8	Lake Fjord.	24. 7.-16. 8.
SYRPHIDÆ.				
<i>Platychirus</i> ? <i>albinus</i> Fabr. . . . .	..	1	Lake Fjord.	24. 7.
— sp. (same as <i>Ungava</i> sp. ?) †. . . . .	..	2	Hurry Inlet.	4-14. 8.
<i>Melanostoma</i> ? <i>lundbecki</i> Coll. . . . .	..	1	Hurry Inlet.	4-14. 8.
<i>Syrphus arcuatus</i> Flin., var. 1 ‡	1	..	Hurry Inlet.	4-14. 8.
— <i>arcuatus</i> Flin., var. 1	1	..	Lake Fjord, 2000 feet, mountain summit.	30. 7.
— <i>arcuatus</i> Flin., var. 2 †	1	..	Lake Fjord.	30. 7.
— <i>torvus</i> O.-S. . . . .	..	1	Lake Fjord.	30. 7.
<i>Helophilus granlandicus</i> Fabr. . . . .	..	1	Lake Fjord.	30. 7.
PHORIDÆ.				
<i>Aphiocheta</i> sp. indet. . . . .	..	1	Lake Fjord.	30. 7.

* On the labels of the specimens collected by Lack are various names—Jameson Land, Constable Point, Liverpool Land, Fame Island. All of these specimens were collected within a few miles of each other in Hurry Inlet, a subsidiary fjord from Scoresby Sound. For purposes of publication, all these localities could be grouped as Hurry Inlet without loss. The locality Rosenvinge Bay, also in Scoresby Sound, had better be kept separate, as it is further away than the others, and refers to Eskimo settlement. Scoresby Sound is in lat. 70° N., Cape Dalton rather to the south, but I have no atlas here to check up its latitude. For more detail refer to David Lack, "Some Insects from the Scoresby Sound Region," *Ann. & Mag. Nat. Hist.* (10) xiv. p. 599 (1934).

—D. LACK.

† *Vide* *Ann. & Mag. Nat. Hist.* xv. p. 370 (1935).

‡ *Vide* *Ann. & Mag. Nat. Hist.* vii. pp. 70-77 (1931).

Family, genus, and species.	♂.	♀.	Locality.	Date (all 1933).
CALLIPHORIDÆ.				
<i>Cynomyia mortuorum</i> L.	1	9	Hurry Inlet.	4-14. 8.
<i>Phormia grœnlandica</i> Ztt.	7	12	Hurry Inlet.	4-14. 8.
	..	1	Cape Dalton.	20. 8.
	..	6	Lake Fjord.	6-24. 7.
	..	1	Rosenvinge Bay.	- 8.
ANTHOMYIDÆ.				
<i>Pogonomyia negus</i> Holm.	1	5	Hurry Inlet.	4-14. 8.
<i>Spilogona trigonifera</i> Ztt. (<i>novæ angliæ</i> Mall.).	5	12	Lake Fjord.	24-29. 7.
— <i>almquisti</i> Holm. ....	..	1	Hurry Inlet.	4-14. 8.
— <i>arctica</i> Zett.	2	7	Lake Fjord.	16-29. 7.
— <i>hyperborea</i> Bohem.	1	1	Lake Fjord.	24-29. 7.
	..	1	Cape Dalton.	20. 8.
— spp. incert. ....	..	2	Lake Fjord.	29. 7.
	..	5	Hurry Inlet.	4-14. 8.
<i>Acroptena verticina</i> Ztt.	1	..	Hurry Inlet.	4-14. 8.
— <i>frontata</i> Ztt.	2	..	Lake Fjord.	29. 7.-16. 8.
	..	1	Hurry Inlet.	4-14. 8.
<i>Pegomyia hæmorrhœa</i> Ztt., var. ..	2	4	Hurry Inlet.	4-14. 8.
<i>Pegohylemyia profuga</i> Stein	4	1	Lake Fjord.	24-29. 8.
<i>Delia</i> sp. ....	..	1	Lake Fjord.	24-29. 8.
<i>Paregle radicum</i> L. ....	..	1	Rosenvinge Bay.	- 8.
<i>Fucellia arcticiformis</i> Holm.	6	4	Rosenvinge Bay.	- 8.
	..	1	Fame Is.	4-14. 8.
	..	1	Lake Fjord.	24-29. 8.
— <i>pictipennis</i> Beck	2	..	Rosenvinge Bay.	- 8.
SCATOPHAGIDÆ.				
<i>Scatophaga lanata</i> Lundb. ....	..	2	Hurry Inlet.	4-14. 8.
— <i>squalida</i> Mg.	14	8	Hurry Inlet.	4-14. 8.
	4	4	Lake Fjord.	6-30. 8.
— <i>nigripalpis</i> Beck (<i>picipes</i> Mall.).	6	..	Hurry Inlet.	4-14. 8.
HELOMYZIDÆ.				
<i>Leria septentrionalis</i> Coll.	3	1	Hurry Inlet.	4-14. 8.
	..	1	Rosenvinge Bay.	- 8.
	4	..	Lake Fjord.	28. 6.-7. 7.
— <i>modesta</i> Mg. ....	..	1	Lake Fjord.	26. 6.
PIOPHILIDÆ.				
<i>Piophilæ pilosa</i> Staeg.	3	5	Hurry Inlet.	4-14. 8.
AGROMYZIDÆ.				
<i>Phytomyza</i> , sp. 1	2	..	Cape Dalton.	20. 8.
—, sp. 2.	1	1	Hurry Inlet.	4-14. 8.
EPHYDRIDÆ.				
<i>Scatella stagnalis</i> Flin. ....	..	2	Hurry Inlet.	4-14. 8.

LXI.—*Results of the Oxford University Expedition to Sarawak (Borneo), 1932.—Gyriniden (Coleoptera).* Von GEORG OCHS, Frankfurt a. Main.

[Plate XVIII.]

In meiner Arbeit von 1928 (Ent. Bl. xxiv. pp. 41–45, 78–85, 98–103) hatte ich den Versuch gewagt, die Gyriniden von Borneo erstmalig zusammenfassend zu bearbeiten. Über die gleiche Fauna habe ich 1930 (Ent. Bl. xxvi. p. 17) einige zusätzliche Angaben gemacht und einen weiteren Nachtrag 1932 (Ent. Bl. xxviii. pp. 172–175) veröffentlicht.

Inzwischen ist mir durch die gütige Vermittlung des Sir Guy A. K. Marshall, Imperial Institute of Entomology in London, von Dr. B. M. Hobby, Hope Department of Entomology, Oxford University, die umfangreiche Gyriniden-Ausbeute zugegangen, welche von der Oxford University Expedition to Borneo 1932 unter seiner Leitung zusammengebracht worden ist. Gleichzeitig stellte mir Herr Dr. Delkeskamp einschlägiges Material aus dem Zoologischen Museum der Universität Berlin zur Verfügung. Den beteiligten Herren möchte ich hierdurch nochmals meinen besten Dank für die bewiesene Gefälligkeit abstatten, ebenso den Herren Dr. Masi in Genua, G. E. Bryant in London und E. Banks in Kuching (Sarawak) für freundlichst übermittelte Aufklärungen und Literatur über Fundorte, und Dr. W. Alt in Frankfurt a. Main für die photographische Wiedergabe des Oedeagus von *O. seminilens*.

Bei der Bearbeitung dieses neuen Materials war es notwendig, die von früher bekannten Arten zum Vergleich heranzuziehen und nochmals genau zu prüfen, wobei sich zeigte, dass die älteren Feststellungen vielfach einer Korrektur bedürftig waren. Es ergab sich ferner, dass es notwendig war, über die Lage der Fundorte Klarheit zu gewinnen, um hierdurch Anhaltspunkte für die systematische Einschätzung der oft sehr nahestehenden Formen zu gewinnen.

Die ersten Arten, welche Régimbart 1882 (Ann. Mus. Stor. nat. Genova, xviii. pp. 72–74) aus Borneo beschrieben hat, entstammten den Ausbeuten von Marquis Doria und Dr. Beccari, die betreffenden Belegstücke befinden sich im Museum in Genua. Dr. Masi hatte die Güte,

mir hierzu folgendes mitzuteilen: "Les insectes furent récoltés dans les alentours de Kuching, le Marquis Doria ne s'étant pas éloigné de ces endroits, ou bien dans la région Sarawak par M. Beccari remontant la rivière Butang, ou en excursion jusqu'au mont Matang." Die genauen Fundorte sind bei den einzelnen Arten leider nicht angegeben, auf alle Fälle stammen diese Exemplare sämtlich aus Süd-Sarawak. Im Gegensatz dazu kommt die Mehrzahl der Arten, welche derselbe Autor 1907 (Ann. Soc. Ent. Fr. lxxvi. pp. 192–221) anführt, vom Berg Kinabalu auf der N.-O. Spitze der Insel, wo eine von den Süd-Sarawak-Arten sehr verschiedene Fauna lebt. Für einige Arten ist Brunei als Herkunft angegeben, diese werden gleichzeitig vom Kinabalu gemeldet. Dagegen trägt die Arten-Zusammensetzung von Pontianak (Westküste), von wo Régimbart eine Ausbeute vorgelegen hat, einen besonderen Charakter und scheint sich an die Süd-Sarawak-Fauna anzulehnen.

Aus dem Nordosten der Insel (Kinabalu) stammt gleichfalls der grössere Teil des von mir 1928, 1929 und 1932 behandelten Materials, zweifellos sind wir über die Gyriniden-Fauna dieses Abschnitts am besten informiert. Gleichzeitig konnten jedoch in der Arbeit von 1928 auf Grund der Bearbeitung der interessanten Bestände des Sarawak-Museums (welche leider auf dem Rücktransport in Verlust geraten zu sein scheinen) zahlreiche Neumeldungen aus den südlich anschliessenden Gebieten erfolgen: Trusan river, Lawas river, Mt. Murud, Lio Matu, Baram river, Mt. Dulit; ebenso aus dem Süd-Sarawak-Gebiet: Kalinkang Mts. mit Mt. Lingga im Osten (hier entspringt der Strap river) und Mt. Merinjak im Westen, Mt. Penrissen (am Südfuss desselben der Fundort P. Amkat) und Mt. Matang. Von Mt. Dulit stammt auch die hierunter behandelte Ausbeute der Oxford University Expedition; im Zool. Anz. cvii. (1934), pp. 202–214, bespricht Falkenström eine Ausbeute vom Mt. Tibang (Museum Stockholm).

Die Mehrzahl der vorerwähnten Lokalitäten sind auf einer Karte zu finden, welche einer faunistischen Arbeit über Säugetiere und Vögel von Banks (1933, Proc. Zool. Soc. Lond. 1933, pp. 273–282) beigelegt ist. Banks unterteilt in dieser Abhandlung die Insel in mehrere Faunenbezirke, doch scheinen bei den Gyriniden die Verhältnisse etwas anders zu liegen. Bei dieser Familie ist es kaum

möglich, die Bewohnerschaft des nördlichen Bezirks und der "intermediate area" von Banks zu trennen, da sie zahlreiche Arten mit einander gemeinsam haben. Dasselbe trifft zu für die südlich anschliessenden Ketten der Nieuwenhuis- (Mt. Tibang), Müller- und Schwaner-Gebirge, so dass die gesamte Zentralkette, die das Rückgrat der Insel ausmacht, eine im Grund einheitliche Gyriniden-Fauna besitzt. Eine stark abweichende Arten-Zusammensetzung findet sich dagegen im Gebiet der isolierten Gebirgsstöcke in Süd-Sarawak (Kalinkang, Penrissen, Matang); unter Hinzurechnung der von Régimbart (*l. c.* 1907) von Pontianak gemeldeten Arten sind von 9 dort nachgewiesenen Arten 7 endemisch. Sehr arm an Gyriniden scheint der südlich der Zentralkette gelegene Teil der Insel zu sein; von dort sind bisher nur die beiden *Dineutus*-Arten bekannt, die gleichzeitig in anderen Teilen der Insel und auch ausserhalb Borneos vorkommen, dagegen kein einziger *Orectochilus*. Vielleicht ist dieses weite Gebiet noch zu wenig besammelt, zum mindesten an den Oberläufen der hier entwässernden Flüsse müsste sicher mit einer grösseren Artenfülle zu rechnen sein.

Was die vertikale Verbreitung anbelangt, so scheint in Borneo bei rund 3000' Seehöhe eine scharfe Faunengrenze zu liegen, im Zusammenhang wohl mit klimatischen Verhältnissen, die äusserlich in der plötzlichen Ablösung des Tropen-Urwaldes durch den im Charakter gänzlich verschiedenen Mooswald ihren Ausdruck finden. Diesbezügliche Schilderungen im Zusammenhang mit Fundorten von denen wir Gyriniden besitzen finden sich in folgenden Aufsätzen: H. M. Pendlebury und F. N. Chasen, 1932, J. F.M.S. Mus. xvii. pp. 1-38 (Kinabalu); T. H. Harriasson, 1933, Geogr. J. lxxxii. pp. 385-410 (Mt. Dulit); G. E. Bryant, 1919, Ent. Mon. Mag. lv. pp. 70-76 (Süd-Sarawak). Banks spricht daher von einer Montan-Fauna über 3000' Seehöhe.

Soweit bei dem bis jetzt vorliegenden Material exakte Höhenangaben existieren, scheinen sich die Gyriniden—zum mindesten als Imago—nicht an diese Grenze zu halten, da zahlreiche Arten sowohl oberhalb als unterhalb gleichzeitig gefunden wurden. Bei einigen von ihnen (z. B. *O. longulus*, *subsinuatus*, *crassipes*) überwiegen Funde aus höheren Lagen, die sie vorzuziehen scheinen. Der Anteil der Arten, die nur unter 3000' erbeutet wurden, beträgt noch nicht 50%; unter ihnen befinden sich

ausnahmslos die wenigen Arten, welche Borneo mit Nachbarfaunen gemeinsam hat (*D. spinosus*, *marginatus*, *O. productus*, *corniger*). Bei mehreren Arten bemerkt man die Tendenz, in höheren Lagen kräftigere Rassen zu bilden (*D. marginatus mjobergi*, *O. mjobergi*, *angulatus*, *castaneus*), gleichzeitig finden wir an den höheren Gebirgsstocken isolierte Arten, die teilweise mit weiter verbreiteten Arten eng verwandt sind (aus Rassenbildung hervorgegangen?), teilweise auf anderen Bergen durch ähnliche Arten ersetzt werden (Vikarianten?).

Alles in allem scheinen die Gyriniden—besonders die den Hauptteil der Fauna Borneos ausmachenden *Orectochilus*-Arten—an die höheren Gebirge gebunden zu sein, da nur von deren Abhängen namhafte Funde vorliegen und die höchsten Erhebungen die grösste Artenfülle aufzuweisen haben. Es ist daher anzunehmen, dass diese Insekten dort ihre günstigsten Daseinsbedingungen vorfinden. Vermutlich spielt hierbei die Menge und Regelmässigkeit der Niederschläge, welche ihre Wohngewässer speisen, die ausschlaggebende Rolle, neben der näheren Beschaffenheit der Wasserläufe (Untergrund, Ufer, Pflanzenwuchs, chemische und thermische Eigenschaften des Wassers, Stömungsverhältnisse und Veränderlichkeit des Wasserspiegels), besonders in Hinblick auf die Bedürfnisse der Larven. Letztere dürften auf speziellere Verhältnisse zugeschnitten sein als die Imagines—nur so ist bei der grossen Beweglichkeit der Käfer, welche schwimmen und fliegen können, die Gebundenheit zahlreicher Arten an ganz bestimmte Lokalitäten hauptsächlich zu erklären—und besonders in den langsam fliessenden, verschlammten und sauerstoffärmeren Flüssen der Ebene, namentlich in ihrer Eigenschaft als Unterwasser-Atmer, weniger gut vorankommen.

Die Gyriniden der Oxford University Expedition stammen aus zwei verschiedenen Fluss-Systemen, u.z.w. entwässert der Koyan river zum Rejang, der Lejok und der Kapah durch den Tinjar zum Baram. Dass die kleine Ausbeute aus dem Koyan eine ganz andere Arten-Zusammensetzung hat als die aus Lejok und Kapah, scheint mir weniger daran zu liegen, dass es sich um ein anderes Fluss-System handelt, sondern weil dieses Gewässer einen ganz anderen Charakter hat. Herr Hobby schreibt mir dazu folgendes: "The Koyan, in the area from which insects were collected, may be divided into two

areas, one a shallow rapid stream flowing evenly over a rocky bed with no outstanding boulders, and the second a wide, deeper and less rapid area or pool. In this, probably, the Gyrinids were taken." Wie aus dem Expeditions-Bericht von Harrisson zu entnehmen ist, ist ausserdem der Einfluss der Gebirgsfauna an dem zum Koyan neigenden Abhang des Dulit-Gebirges grösser als in gleicher Höhenlage am Abhang zum Tinjar. Am Koyan wurden erbeutet *O. laticinctus*, welcher vom Kinabalu (1500 m.) bekannt ist, *O. seminitens*, dessen nächster Verwandter am Mt. Tibang erbeutet wurde, und *O. pusillus* (?), der sich mit Exemplaren, die mir früher aus Süd-Sarawak (P. Amkat) vorgelegen haben, zu decken scheint.

Am Lejok wurde im Gebiet des Mooswaldes gesammelt. In diesen höheren Lagen fanden sich *O. dispar* und *subsinnuatus*, letzterer anscheinend die dominierende Art. Das Tagebuch des Herrn Ford sagt dazu: "Gyrinids—above the falls in fairly still water, under rock ledges." Weiter unten ist die Auswahl der Arten grösser: *O. dispar*, *semirufus*, *dulitensis*, *castaneus*, *subsinnuatus* (vereinzelt) und *biformis*, in dem erwähnten Tagebuch wird dazu gesagt: "Gyrinids—swimming in sheltered spot, Lejok river, 850 ft. Occurring up to foot of large waterfall (1750 ft.)." Herr Hobby schreibt ferner: "The Lejok in the region in which the latter were collected is a swift torrent, liable to frequent floods [der Tinjar kann nach Harrisson's Bericht in einer Nacht 40 Fuss steigen !]. The bed is very rough and water runs rapidly between large boulders, the latter breaking up the current and in some places causing shelter, where water is comparatively still—in such places these beetles occur. Above the falls the stream flows fairly evenly, though there are large pools of still water. In general, however, most surface insects on the top of Dulit are to be found in the numerous small streams which join together to form the Lejok, e. g. adult Hydrometridæ (Heteroptera) were only found in these streams, though nymphs occurred in the main stream and probably were frequently swept over the falls."

Die Gyrinidenfauna des Mt. Dulit ist nach der des Mt. Kinabalu wohl die bis jetzt am besten bekannte von ganz Borneo, denn die Ausbeute der Oxford University

Expedition ergänzt sich auf das Beste mit der früher von mir bearbeiteten des Dr. Mjöberg, der seinen Aufstieg ebenfalls an der zum Tinjar neigenden Seite, aber etwas weiter flussabwärts bewerkstelligt hat. Zum Teil wurden daher auch die gleichen Arten erbeutet, bei der Oxford-Ausbeute kommt *O. biformis* als neue Art hinzu, dagegen fehlt leider der interessante *D. marginatus mjobergi*. Von den gesammelten *Orectochilus*-Arten haben *O. dispar* und *castaneus* eine weitere Verbreitung, vermutlich sind diese in der ganzen Zentralkette zu finden. *O. semirufus* ist eine Lokalform, deren Verwandte in Süd-Sarawak leben. *O. biformis* hat Verwandte in Süd-Sarawak und am Kinabalu, *O. dulitensis* und *subsINUATUS* werden am Kinabalu durch ähnliche Formen bezw. Arten ersetzt, jedenfalls sind also die Beziehungen der Gyriniden-Fauna des Mt. Dulit zu der von Süd-Sarawak geringer als zu der von Kinabalu.

Die Reihenfolge der nachstehend besprochenen Arten habe ich wie in den früheren Arbeiten belassen, obgleich vielleicht versucht werden sollte, dieselben ihren Abstammungsverhältnissen und mutmaasslichen phylogenetischen Alter nach zu gruppieren. Ich muss indessen gestehen, dass ich in dieser Beziehung bei *Orectochilus* noch wenig klar sehe.

Orectochilus dispar Rég.

Orectochilus dispar Rég., 1907. Ann. Soc. Ent. Fr. lxxvi. p. 192.

Orectochilus dispar Ochs, 1928, Ent. Bl. xxiv. p. 79.

Orectochilus dispar Falkenström, 1934, Zool. Anz. cvii. p. 204.

Dulit trail, 22. viii. 1932, primitive forest (*Shackleton*), 1 ♀, nur 9 mm. lang.

Foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 22. viii. 1932, Lejok stream, below surface, alt. 850 ft., primitive forest (*Hobby & Moore*), 1 ♂.

10. ix. 1932, under growth, old secondary forest (*Hobby & Moore*), 1 ♀.

River Kapah, tributary of river Tinjar, 24. ix. 1932, primitive forest (*Hobby & Moore*), 1 ♂.

River Lejok, fairly still water, 15. x. 1932, moss forest (*Hobby, Moore, & Ford*), 2 ♀♀.

[*Orectochilus nigricaudatus* Ochs.] *.

Orectochilus crassipes subsp. *nigricaudatus* Ochs, 1932, Ent. Bl. xxviii. p. 172.

Orectochilus coracinus Falkenström, 1934, Zool. Anz. cvii. p. 213.

* Die eingeklammerten Arten wurden von der Expedition nicht erbeutet.

In meinem Material haben sich noch einige Stücke vorgefunden, welche infolge mangelhafter Präparation früher nicht erkannt wurden. Es sind Exemplare von 14 mm. Länge dabei, die also dem *O. crassipes* an Grösse nicht nachstehen, und ich glaube jetzt sicher, dass es sich um eine zweite Art handelt, da eine Reihe von Unterscheidungsmerkmalen vorliegen und auch die Wohngebiete sich überschneiden. Die beiden Arten sind leicht zu trennen, wenn der Hinterleib über die Flügeldecken vorragt, da die Tergite bei *O. nigricaudatus* dunkel, bei *O. crassipes* dagegen rot gefärbt sind, ausserdem ist das letzte Abdominal-Segment bei ersterem schmaler. Ferner sind bei *O. nigricaudatus* die Vordertarsen des ♂ schmaler als das Schienenende, bei *O. crassipes* breiter, und die Tomentbinde bei beiden Geschlechtern schmaler. Bei *O. nigricaudatus* reicht dieselbe auf dem Halasschild vorn nur bis zur Augenmitte (bei *crassipes* die ganze Augenbreite erreichend), auf den Flügeldecken ist sie hinten weniger stark verbreitert, trifft weiter aussen auf die schmale Verlängerung zur Naht, läuft daher auf grössere Entfernung mit der Trunkatur parallel und der glatte Raum endigt infolgedessen in einer breiteren verrundeten Spitze. Es trifft ferner zu, was Falkenström zuerst beobachtet hat, dass der Trochanter des Vorderbeins beim ♂ auf der Vorderseite nur eine schmale Furche zeigt, während bei *O. crassipes* diese Furche bedeutend breiter und stärker beborstet ist, ausserdem sind bei letzterer Art die Vorderschienen apikal stärker schräg abgeschnitten. Alles in allem dürfte nach der Beschreibung des *O. coracinus* Falk. letzterer mit meinem *O. nigricaudatus* identisch sein; die Schwarzfärbung seiner Stücke ist vermutlich individuell, während die mir vorliegenden Exemplare die gleichen Schwankungen in der Färbung aufweisen wie *O. crassipes* in grösseren Serien, *O. nigricaudatus* ist enthalten in den früher unter *O. crassipes* aufgeführten Serien von Kinabalu 1500 m. (*Waterstradt* leg.), Kiau, 25. iii. 1929 (*Pendlebury*), und andres Material ohne genaue Fundortangabe aus den Museen in Dresden und Berlin. Unter letzteren auch einige schwarze Stücke und Uebergänge dazu.

Da Falkenström den immerhin stark verschiedenen *O. corpulentus* Rég. bei der Besprechung seines *O. coracinus* und des *O. dispar* zum nahen Vergleich heranzieht und

von Java erwähnt, sei wiederholt festgestellt, dass diese Art mit Sicherheit bisher nur aus Burma und dessen nächster Nachbarschaft festgestellt ist, und ebenso gewiss weder auf Borneo noch auf Java vorkommt. Man findet diese Art in älteren Sammlungen verstreut mit allen möglichen nicht ernstzunehmenden Fundortbezeichnungen, doch soll man es vermeiden, derartige Falschangaben durch kritiklose Wiederholung in der Literatur zu verewigen, zumal wenn entsprechende Korrekturen bereits vorliegen.

Orectochilus mjobergi semirufus Ochs.

Orectochilus mjobergi var. *semirufus* Ochs, 1928, Ent. Bl. xxiv. p. 82.

Orectochilus mjobergi var. *semirufus* Ochs, 1930, Ent. Bl. xxvi. p. 17.

Foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 22. viii. 1932, Lejok stream below surface, alt. 850 ft., primitive forest (*Hobby & Moore*); 4 ♂♂, 3 ♀♀. 22. viii. 1932, cultivated land, now waste (*Hobby & Moore*), 1 ♂.

Völlig identisch mit den früher von Mjöberg am Mt. Dulit erbeuteten Stücken, welche mir zur Beschreibung dienten. Vielleicht artlich von der Nominatform verschieden, denn der Oedeagus ist schlanker, subparallel, apikal flach verrundet, etwa vor der Mitte beiderseitig leicht eingeschnürt, ausserdem eine stärkere Einschnürung im Basalteil, apikal etwa ebensobreit wie das Ende einer Paramere. Bei *O. mjobergi* vom Mt. Penrissen ist der Oedeagus etwa doppelt so breit und die distale Einschnürung liegt kurz vor dem Apex, ähnlich aber etwas schmaler bei den Stücken von Kaling-Kang und Mt. Lingga, über deren artliche Identität mit der Nominatform man abenfalls im Zweifel sein kann. Die Form *semirufus* ist von dem typischen *mjobergi* ausser in Grösse und Färbung ferner leicht verschieden durch regelmässiger rundmaschige Retikulierung der Flügeldecken, etwas prononziierteren apikalen Aussenwinkel der Flügeldecken und geradere Innenkante der Seitenbinde des Halschilds. Bei beiden Formen ist beim ♂ das erste Tarsenglied aussen kantig erhöht.

Orectochilus dulitensis Ochs.

Orectochilus dulitensis Ochs, 1928, Ent. Bl. xxiv. p. 82.

(?) *Orectochilus dulitensis* Ochs, 1932, Ent. Bl. xxviii. p. 173.

Foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 22. viii. 1932, Lejok stream, below surface, alt. 850 ft.,

primitive forest (Hobby & Moore); 13 Exemplare. 22. viii. 1932, cultivated land, now waste (Hobby & Moore), 2 St.

Wie die Typen! Oedeagus lang, subparallel, apikal flach verrundet, im Basalteil ein stärkere Einschnürung, im Apikalteil kaum eingeschnürt, von oben gesehen etwa so breit wie eine Paramere.

Bei *O. murudensis* Ochs ist der Oedeagus ähnlich, aber der Apex deutlich leicht verbreitert. Bei *O. matruelis* Rég. befindet sich eine Einschnürung im letzten Viertel der Länge, das Ende ist deutlich verbreitert, apikal gerade abgeschnitten und kurz aufgebogen. Bei *O. acutilobus* Rég. ist der Oedeagus pfriemenförmig, etwa so breit wie eine Paramere, in der Mitte kräftig eingeschnürt, Spitze von der Seite gesehen kurz abgesetzt und aufgebogen. Bei *O. palawanensis* Rég. von Binaluan ist die Bildung ähnlich dem letzteren, jedoch viel zierlicher, von der Mitte zum Apex verjüngt, seitlich gesehen nur halb so breit, allmählich in die andeutungsweise S-förmig aufgebogene Spitze verjüngt.

[*Orectochilus palawanensis* Rég.]

Orectochilus palawanensis Rég. 1907, Ann. Soc. Ent. Fr. lxxvi. p. 195.

Orectochilus palawanensis Ochs, 1928, Ent. Bl. xxiv. p. 83.

Ausser den früher bereits erwähnten Exemplaren (l. c. 1928): 1 Paratype ♀ von Süd-Palawan und einer kleinen Serie von Nord-Palawan, liegen mir jetzt noch 3 ♂♂ vor, bezettelt "Palawan" aus der Sammlung Moser, jetzt im Zool. Museum der Universität Berlin, und 2 weitere ♂♂ mit Etikette N. Borneo, Kinabalu, gleicher Provenienz. Bei letzteren würde ich ohne weiteres Falschbezettelung annehmen, wenn diese Stücke nicht gleichzeitig im Penisbau etwas von den Palawan-Stücken abweichen würden. Es ist daher nicht ausgeschlossen, dass diese Exemplare tatsächlich von der Hauptinsel stammen (gleiche Etikette tragen Stücke von *O. planiusculus*, *nigricaudatus* und *crassipes* aus der gleichen Sammlung), ausser der Penisdifferenz kann ich jedoch kaum einen Unterschied feststellen. Wölbung vielleicht etwas geringer, Grösse 8–8½ mm.

Die 3 Stücke von "Palawan" sind ebenfalls grösser als von Regimbart angegeben und messen 7–8¼ mm. Im übrigen entsprechen sie der Urbeschreibung, welche

jedoch unter gleichzeitiger Zugrundlegung der Paratype in meinen Besitz in folgendem ergänzt werden muss: Rotfärbung der Unterseite ergreift auch die Epipleuren und bis zu einem gewissen Grade das ganze Abdomen und die Seiten der Bruststücke; Maschen der Retikulierung auf dem Kopf leicht quer, mehr oder weniger ebenso auf dem Halsschild, auf den Flügeldecken in der Schildchengegend schräggestellt; Tomentbinde an der Basis der Flügeldecken leicht breiter als an der korrespondierenden Stelle des Halsschildes; Seitenrand der Flügeldecken vorn sehr schmal, im letzten Drittel der Länge kräftig nach innen verbreitert; ♀ flacher gewölbt als das ♂; Oedeagus des ♂ von oben gesehen pfriemenförmig, von der Basis zur Spitze allmählich verjüngt, etwa in gleicher Breite wie die Parameren, Basalhälfte auf der Oberseite mit Längsrinne, seitlich gesehen mit aufgebogener Spitze und einer leichten Einschnürung kurz nach der Mitte. Bei den Stücken von N. Borneo etwas kürzer und plumper.

[*Orectochilus palawanensis* subsp. *boettcheri* nov.]

Orectochilus palawanensis Ochs, 1928, Ent. Bl. xxiv. p. 83.

Etwas kürzer und breiter als die Nominatform, die unbehaarten Partien der Oberseite mit Erzschein, Unterseite stärker aufgehellte, ♀ nur wenig flacher als das ♂, letzteres in der Wölbung mehr den Borneo-Stücken entsprechend, Oedeagus viel schlanker und schmaler als bei der Nominatform, apikal höchstens halb so breit als eine Paramere.

Habitat.—Nord-Palawan, Binaluan, xi.–xii. 1913 (G. Boettcher).

Typus ♂ und Allotypus ♀, sowie 2 Paratypen in meiner Sammlung.

Orectochilus castaneus Rég.

Orectochilus castaneus Rég. 1907, Ann. Soc. Ent. Fr. lxxvi. p. 199.

Orectochilus castaneus Ochs, 1928, Ent. Bl. xxiv. p. 98.

Orectochilus castaneus Ochs 1932, Ent. Bl. xxviii. p. 174.

Foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 22. viii. 1932, Lejok stream below surface, alt. 850 ft., primitive forest (*Hobby & Moore*), 2 ♂♂.

Der Oedeagus ist ähnlich geformt wie bei *O. subsinuatus* Ochs, länger im Verhältnis zu den Parameren, stärker zugespitzt, seitlich gesehen weniger S-förmig gebogen.

Die von mir 1930, Ent. Bl. xxvi. p. 17, erwähnten Exemplare aus dem Dresdener Museum gehörten nicht zu *O. castaneus*, sondern zu der hierunter neubeschriebenen Art.

Zu den früher (*l. c.* 1928) angegebenen Unterscheidungsmerkmalen gegen *O. staudingeri* kommt hinzu: bedeutend flachere Gestalt; stärker S-förmig geschweifte Innenkante der Tomentbinde des Halsschildes; mehr parallelseitiger Oedeagus mit stärker aufgebogener Spitze.

[*Orectochilus planiusculus*, sp. n.]

Orectochilus castaneus Ochs, 1930, Ent. Bl. xxvi. p. 17.

♀.—Long. 5–5½ mm. Oblongo-ovatus, elongatus, postice leviter attenuatus, parum convexus, depressus. Supra nitidus, castaneoferrugineus, ad latera punctato-tomentosus, pubescentia lutea, postice anguste ferrugineo-limbatus; infra ferrugineus, in medio infuscatus. Labro transversali, supra punctato-piloso, antice arcuato et flavo-ciliato. Clypeo antice leviter emarginato. Reticulatione in regionibus glabris subtilissima, transversa, vix visibili, punctatura minutissima remota. Margine tomentoso in pronoto parum lato, antice latiore, in elytris continuato, post medium fortiter dilatato et suturam ad quintam partem attingente. Spatio laevi in elytris oblongo, postice triangulariter acuminato. Truncatura leviter obliqua, angulo suturali anguste rotundato, externo obtuso distincto. Tibiis anticis apicem versus modice intus dilatatis, antice recte truncatis, angulo apicali externo anguste rotundato; tarsis apicem versus attenuatis. ♂ ignotus.

Habitat.—N.-O. Borneo (Vermächtnis Gebr. Müller).

Typus ♀ in meiner Sammlung, weitere Stücke ebendasselbst und im Museum Dresden, von wo die Type stammt sowie von N. Borneo, Kinabalu, im Zool. Museum der Universität Berlin.

Bisher mit *O. castaneus* Rég. vermennt, mit dem die neue Art ungefähr die gleiche Grösse hat, sie ist aber länglicher von Gestalt und von der Seite gesehen viel flacher, woran leicht erkenntlich. Ausserdem ist die Mikroskulptur der Oberseite viel feiner und die tomentierte Seitenbinde an der Berührungsstelle von Halsschild und Flügeldecken gleichbreit (bei *O. castaneus* auf den Flügeldecken breiter als auf dem Halsschild). Der glatte Raum auf den Flügeldecken reicht weiter nach hinten, die Trunkatur aussen ohne Schweifung.

*[Orectochilus planatus, sp. n.]**Orectochilus staudingeri* Ochs, 1930, Ent. Bl. xxvi. p. 17.*Orectochilus staudingeri* Ochs, 1932, Ent. Bl. xxviii. p. 174.

Long. $6\frac{1}{2}$ –7 mm. Ovatus, elongatus, postice attenuatus, modice convexus. Supra nitidissimus, castaneo-ferrugineus, in capite senescens, labro et clypeo rufescentibus, ad latera tomentosus, pubescentia aurea; infra piceo-ferrugineus, abdomine, epipleuris pedibusque rufo-ferrugineis. Labro transversali, antice arcuato et flavo-ciliato, supra punctato-piloso. Clypeo antice recte truncato nec emarginato. Supra in regionibus glabris reticulatus et remote punctatus, reticulatione in capite sat fortiter impressa (areolis leviter transversis), in pronoto multo minus impressa, in elytris subtilissima, transversa et obliqua. Margine tomentoso in pronoto sat lato, post oculos dilatato, in elytris antice paulo latiori, circiter ad medium (in ♀ paulo post medium) fortiter dilatato et suturam ad quintam partem attingente. Spatio laevi elytrorum longe cordiformi, post medium subangulatim constricto, in ♀ magis oblongo, postice acuminato. Truncatura leviter obliqua, angulo suturali leviter rotundato, externo obtuso, haud deleto. Tibiis anticis in ♂ sat robustis, triangularibus, antice recte truncatis, angulo apicali externo rotundato, in ♀ minus dilatatis; tarsis anterioribus in ♂ dilatatis, oblongis, antice breviter attenuatis, in ♀ minus dilatatis, subparallelis, leviter attenuatis.

Habitat.—Borneo, Kinabalu, Kenokok river, 3300 ft., 23. iv. 1929 (*H. M. Pendlebury*).

Typus ♂ in meiner Sammlung; Allotypus ♀ von N.-O. Borneo, früher vom Museum Dresden erhalten, wo sich wahrscheinlich noch weitere Stücke befinden.

Wurde von mir früher fälschlich als zu *O. staudingeri* Rég. gehörig angesehen, ist aber unterscheidbar durch die mehr längliche und weniger gewölbte Gestalt, die stärker geschweifte Innenkante der Tomentbinde des Halschilids und die apikal schwächer verjüngten, mehr ovalen Vordertarsen des ♂*. Verschieden sind ferner die männlichen Genitalien. Bei *O. planatus* ist der Oedeagus schmaler und etwas kürzer als die Parameren,

* Anscheinend besteht ein Irrtum, wenn Régimbart (1907, Ann. Soc. Ent. Fr. lxxvi. p. 198) angibt, dass die Vorderbeine des ♂ bei *O. staudingeri* merklich robuster seien als bei *O. matruelis*. Wohl sind die Tibien bei ersterem länger, aber nicht breiter, und die Vordertarsen weniger oval und apikal stark verjüngt, also eher zierlicher zu nennen.

subparallel, in der Mitte leicht eingeschnürt, in einer stumpfen Spitze endigend; von der Seite gesehen letztere leicht S-förmig gebogen. Bei *O. staudingeri* ist der Oedeagus plumper, kürzer, pfriemenförmig, von der Basis zur Spitze verjüngt, mit kaum merklicher Aufbiegung der letzteren.

Grosse Ähnlichkeit besteht mit *O. subsinuatus* Ochs, doch ist die neue Art eher noch etwas schlanker und flacher, der glatte Raum auf den Flügeldecken durchschnittlich länger und stärker zugespitzt, obgleich hier mit einem gewissen Grad von individueller Variabilität gerechnet werden muss. Beim ♂ ist der apikale Aussenkinkel der Vorderschienen nicht nach aussen vorgezogen, die Vordertarsen sind mehr oblong und apikal schwächer verjüngt, der Oedeagus seitlich gesehen weniger stark aufgebogen, sonst ähnlich.

Orectochilus subsinuatus Ochs.

Orectochilus subsinuatus Ochs, 1928, Ent. Bl. xxiv. p. 99.

Foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 22. viii. 1932, Lejok stream, below surface, alt. 850 ft., primitive forest (*Hobby & Moore*), 1 ♂.

Mt. Dulit, 4000 ft., 25. x. 1932, under overhanging rocks (*Hobby, Moore, & Ford*), 1 ♂, 1 ♀.

Mt. Dulit, river Lejok, fairly still water, 15. x. 1932, moss forest (*Hobby, Moore, & Ford*), series.

Mit diesem Material wurde zum ersten Mal das ♀ dieser Art erbeutet. Dieses ist durchschnittlich etwas kleiner und länglicher als das ♂, der glatte Raum auf den Flügeldecken reicht bei ihm etwas weiter nach hinten und ist oval mit kurzer Spitze. Der Oedeagus des ♂ ist kürzer als die Parameren, von oben gesehen pfriemenförmig, wenig verjüngt, etwas breiter als eine Paramere, von der Seite gesehen stark S-förmig gekrümmt mit aufgebogener stumpfer Spitze.

Da kräftig entwickelte Männchen des *O. staudingeri* eine ähnliche Bildung der Vorderschienen aufzuweisen haben wie bei *O. subsinuatus*, seien als Unterscheidungsmerkmale für letzteren erwähnt: länglichere, schwächer gewölbte Körperform; stärker S-förmig geschweifte Innenkante der Tomentbinde des Halsschildes (ausnahmsweise gerade bei *staudingeri*); Oedeagus parallelseitiger und in der Seitenansicht stärker gekrümmt

Orectochilus biformis, sp. n.

Long. ♂ 8 mm., ♀ 6–7 mm. Ovatus, sat elongatus, postice attenuatus, convexus. Supra niger, nitidus, in capite et pronoto leviter senescens, ad latera late tomentosus, pubescentia lutea, ferrugineo-limbatus; infra piceus, abdomine pedibusque rufescentibus, epipleuris ferrugineis. Labro transverso, postice punctato-piloso, antice subtiliter reticulato, leviter arcuato et flavo-ciliato. Capite fortiter reticulato, areolis rotundatis, in clypeo magis transversis. Reticulatione in pronoto minus impressa, areolis elongatis transversis, in spatio laevi elytrorum subtilioribus elongatissimis obliquis. Margine tomentoso in pronoto latissimo, spatio laevi regulariter trapezoidali, in elytris spatio laevi scutellari in ♂ angusto, antice subparallelo, postice acuminato, in ♀ multo latiore subcordiformi. Truncatura elytrorum obliqua, angulo suturali leviter rotundato, in ♂ extus sinuata, angulo externo distincto subprominulo, in ♀ convexa, nec sinuata, angulo externo fere deleto. Tibiis anticis rectis, apicem versus intus dilatatis, ad basin attenuatis, antice recte truncatis, angulo externo apicali rotundato; tarso parum dilatato, regulariter a basi ad apicem attenuato, lateribus rectis. In ♀ tibiis anticis minus dilatatis; tarso angusto subparallelo.

Habitat.—Borneo, Sarawak, foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 22. viii. 1932, Lejok stream below surface, alt. 850 ft., primitive forest (*Hobby & Moore*).

Typus ♂ im British Museum. Allotype ♀ und 3 Paratypen ♀ ebendasselbst und in meiner Sammlung.

Der folgenden Art ähnlich, aber kleiner und im weiblichen Geschlecht von ihr und den anderen Verwandten leicht zu unterscheiden durch die aussen nicht geschweifte Trunkatur und den fast verrundeten apikalen Aussenwinkel der Flügeldecken. Die unbehaarte Skutellarpartie ist beim ♂ schmaler als bei *O. kinabaluensis* Ochs (weniger als die Hälfte der Entfernung von der Flügeldecken-naht bis zur Mündung der Haarbinde des Halsschildes an dessen Basis einnehmend), beim ♀ ebenfalls von geringerer Ausdehnung, wenn auch ähnlich geformt wie bei der verglichenen Art. Der Oedeagus des ♂ ist von oben gesehen sehr schlank, Oberseite mit Ausnahme der Basis und der Spitze längskielig mit Längsrinne etwa in der Mitte der Länge und von etwa 1/4 der Gesamtlänge des Glieds. In Höhe der Längsrinne beiderseits mit

breitem Hautsaum und hörnchenartigen Vorragungen, basalwärts leicht eingeschnürt, bis zum Beginn der eigentlichen Spitze ziemlich parallel, letztere von der Seite gesehen stark aufgebogen, woran man die Art leicht erkennt.

[*Orectochilus kinabaluensis*, sp. n.]

Orectochilus pubescens Rég., 1907, Ann. Soc. Ent. Fr. lxxvi. p. 201 (Kinabalu).

Orectochilus pubescens Ochs, 1928, Ent. Bl. xxiv. p. 99 (Kinabalu).

Orectochilus pubescens Ochs, 1932, Ent. Bl. xxviii. p. 174 (Kinabalu).

Der echte *O. pubescens* Rég. stammt von Sarawak (S.W. Borneo) und wird als nächste Art besprochen. Die Stücke von Kinabalu (N.-O. Borneo) sind artlich verschieden. Die von Régimbart (l. c. 1907) gegebene Diagnose vermischt die Charaktere des echten *O. pubescens* mit denen der neuen Art vom Kinabalu; für letztere gelten folgende Angaben:

Long. ♂ 8-9, ♀ 7-7½ mm. Ovatus, sat elongatus, postice attenuatus, valde convexus. Supra piceo-niger, nitidus, in regionibus glabris leviter senescens, ad latera late tomentosus, pubescentia lutea, ferrugineo-limbatus; infra piceus, abdomine pedibusque rufescentibus, epipleuris ferrugineis. Labro transverso, postice punctato-piloso, antice subtiliter reticulato, leviter arcuato et flavo-ciliato. Clypeo postice sat fortiter reticulato (areolis fere rotundatis), remote punctato, antice fere laevi, leviter emarginato. Reticulatione in capite et pronoto sat fortiter impressa, areolis rotundatis, in disco pronoti magis transversis, minus impressis, in spatio laevi elytrorum subtilioribus, elongatissimis, obliquis. Margine tomentoso in pronoto latissimo, spatio laevi regulariter trapeziformi, in elytris spatio scutellari laevi in ♂ parum lato, antice subparallelo, postice acuminato, in ♀ multo latiori, subcordiformi. Truncatura elytrorum leviter obliqua, extus leviter sinuata, angulo externo distincto, subprominulo. Tibiis anticis rectis, apicem versus intus dilatatis, ad basin attenuatis, antice recte truncatis, angulo apicali externo rotundato; tarso parum dilatato, regulariter a basi ad apicem attenuato, lateribus fere rectis. In ♀ tibiis anticis minus dilatatis, tarso angusto subparallelo.

Habitat.—Britisch Nord-Borneo, Kinabalu, 1500 m. (*Waterstradt*).

Typus ♂ und Allotypus ♀ im Zoologischen Museum der Universität Berlin, Paratypen ebendasselbst und in

meiner Sammlung, das von Régimbart (l. c. 1907) erwähnte Material von Oberthür und Staudinger stammt anscheinend aus der gleichen Quelle.

Zu *O. kinabaluensis* gehören ferner die früher von mir als *pubescens* erwähnten Stücke von N.-O. Borneo (Museum Dresden); Kinabalu, 2500 ft., 22. viii. 1913 (Sarawak Museum); Kinabalu, 3500 ft., 8. iv. 1929, 4000 ft., 18. iv. 1929 (Pendlebury, F.M.S. Museum); Kenokok river, 3300 ft., 23. iv. 1929 (*id.*); Kouno to Kabayan, 1000 ft., in stream, 6. v. 1929 (*id.*).

Dies ist die grösste Art der Gruppe, von länglicher Gestalt und starker Wölbung, besonders das ♂ hinter dem Schildchen fast etwas bucklig. Oberseite ohne Rotfärbung, auch das Analtergit dunkel, höchstens die Spitze rötlich. Die glatten Partien von Kopf, Halsschild und Flügeldecken mit Erzschein. Die glatte Skutellarpartie des ♂ ist breiter als bei voriger Art (mehr als die Hälfte der Entfernung von der Flügeldeckennaht bis zur Mündung der Haarbinde des Halsschilds an dessen Basis einnehmend), vorn subparallel, hinten spitz verlaufend, weniger als die Hälfte der Flügeldeckenlänge einnehmend; beim ♀ ausgesprochen herzförmig, etwa von halber Flügeldeckenlänge, in der grössten Breite breiter als die glatte Mittelpartie des Halsschilds.

Der Oedeagus ist von oben gesehen breiter, von der Basis zum Apex allmählich verjüngt, mit geringfügiger Einschnürung kurz vor der Spitze. Die Oberseite hat, mehr nach der Basis zu gelegen, eine Längsrinne von etwa halber Länge des Glieds, welche sich bis zum Beginn der Spitze nach vorn kielig fortsetzt. Längs der Unterkante verläuft beiderseits, von oben fast auf die ganze Länge sichtbar, ein breiter Hautsaum, über diesem etwas vor der Mitte beiderseits eine hörnchenartige Vorrangung. Seitlich gesehen ist der Oedeagus an dieser Stelle etwa am breitesten, weiter vorn nochmals leicht eingeschnürt, die rundliche Spitze nur leicht aufwärts gebogen.

[*Orectochilus pubescens* Rég.]

Orectochilus pubescens Rég., 1882, Ann. Mus. Stor. Nat. Genova, xviii. p. 73.

Orectochilus pubescens Rég., 1883, Ann. Soc. Ent. Fr. (6) iii. p. 419, T. xii. f. 127, 127 a.

"*Gyrinides*" Bryant, 1919, Ent. Mon. Mag. iv. p. 76.

Orectochilus ferruginicollis Ochs, 1924, Ent. Bl. xx. p. 238.

Orectochilus ferruginicollis Ochs, 1928, Ent. Bl. xxiv. p. 100 (ex p.).

Orectochilus pubescens Ochs, 1928, Ent. Bl. xxiv. p. 99 (ex p.).

Régimbart beschrieb (l. c. 1882, 1883) seinen *O. pubescens* nach einem einzelnen ♂ von Sarawak aus der Ausbeute des Marchese J. Doria und Dr. O. Beccari. Liest man diese Beschreibung aufmerksam, so stösst man auf Merkmale, die für Stücke vom Kinabalu, die Régimbart später zu *pubescens* stellte, nicht zutreffen, namentlich die Rotfärbungen an Oberlippe, Vorderkopf und der Oberseite des Analtergits. Dies veranlasste mich, die mir vorliegenden Serien einer nochmaligen gründlichen Prüfung zu unterziehen, zumal *O. biformis* aus dem Dulit-Gebiet als weitere neue Art dieser schwierigen Gruppe hinzukam, wobei sich herausstellte, dass die Stücke aus Süd-Sarawak mit der Urbeschreibung des *O. pubescens* Rég. übereinstimmen, während die bisher fälschlich zu *pubescens* gerechneten Exemplare vom Kinabalu eine andere Art repräsentieren, die vorstehend von mir als *O. kinabaluensis* beschrieben wurde.

Der echte *O. pubescens* liegt mir vor von Sarawak, Mt. Merinjak, 600 ft., 23. v. 1914 (G. E. Bryant) und Matang, 3600 ft., vi. 1900, 3200 ft., 1. viii. 1909; letztere etwas dunkler gefärbt als erstere. Diese Art ist durchschnittlich etwas kleiner als *O. kinabaluensis*, etwas grösser als *O. ferruginicollis* Rég., dem sie gleichzeitig infolge der kürzeren Gestalt und der Zunahme der roten Färbungselemente am nächsten steht. Vorderrand von Oberlippe und Clypeus sind bei *O. pubescens* rot, desgleichen die Oberseite des Analtergits, und die glatten Partien von Halsschild und Flügeldecken sowie der hintere Teil der letzteren rötlich durchscheinend. Die Wölbung ist flacher als bei *O. kinabaluensis*, etwa wie bei *O. ferruginicollis*, und wie bei letzterem das ♀ merklich flacher als das ♂. Beim ♂ ist die glatte Skutellarpartie schmaler als bei *O. kinabaluensis* und *ferruginicollis*, ähnlich wie bei *O. biformis*, von länglich dreieckiger Form, oft im vorderen Teil etwas parallelseitig, zur Spitze manchmal etwas eingeschnürt, etwa $\frac{1}{3}$ der Flügeldeckenlänge erreichend. Beim ♀ ist diese Partie breiter als beim ♂ und etwas länger, von leicht herzförmiger Form, schmaler als der glatte Raum des Halsschildes, in der Ausdehnung ähnlich wie bei *O. ferruginicollis*, viel kleiner als bei *O. kinabaluensis*.

Der Oedeagus des ♂ ähnelt dem des *O. kinabaluensis*, aber ohne den breiten Hautsaum und daher in der Aufsicht schmaler erscheinend. Die Längsrinne der Oberseite liegt mehr nach der Spitze zu, nach vorn weniger kielig, davor und dahinter eine leichte Einschnürung, die hörnchenartigen Vorragungen etwa unter der Mitte der Längsrinne. Seitenansicht ähnlich wie bei *O. kinabaluensis*, Spitze kaum aufgebogen und schärfer.

Bei *O. ferruginicollis* Rég. ist der Oedeagus von oben gesehen viel schlanker als bei den verwandten Arten. Der Basalteil verjüngt sich rapid nach vorn, die restlichen etwa $\frac{3}{4}$ der Länge sehr schmal und subparallel, schmaler als eine Paramere. Hautsaum der Unterkante nur schmal, die hörnchenartigen Vorragungen hinter der Mitte. Die Längsrinne der Oberseite ebenfalls hinter der Mitte, der davor liegende Teil scharf kielig bis kurz vor das Ende. Letzteres leicht verbreitert, geschlitzt, zwischen den zangenartig vorragenden Seitenteilen ragt in der Mitte ein quer abgestutztes Mittelstück vor, ähnlich wie ein Penis zwischen den Parameren, also eine sehr merkwürdige Bildung. Seitlich gesehen ist der Oedeagus ebenfalls sehr schmal, die grösste Breite liegt hinter der Mitte, nach vorn allmählich verjüngt, die Spitze leicht aufwärts gerichtet.

[*Orectochilus pendleburyi* Ochs.]

Orectochilus cupreolus Ochs, 1928, Ent. Bl. xxiv. p. 101.

Orectochilus cupreolus Ochs, 1930, Ent. Bl. xxvi. p. 17.

Orectochilus pendleburyi Ochs, 1932, Ent. Bl. xxviii. p. 174.

Orectochilus brevitarsis Falkenström, 1934, Zool. Anz. ovii. p. 208.

Zweifelloos ist *O. brevitarsis* Falk. mit meinem *O. pendleburyi* identisch, und es ist bedauerlich, dass Falkenström vor Abfassung seiner Arbeit nicht genügend die Literatur zu Rat gezogen hat. Mein Aufsatz von 1932 hätte ihm alsdann nicht verborgen bleiben können, und der Nomenklatur wären die Synonyme des *O. brevitarsis* und *O. coracinus* erspart geblieben. Ausserdem wäre die unfreundliche Polemik überflüssig gewesen, die Falkenström an meine ursprüngliche Falschinterpretation des *O. cupreolus* Rég. knüpft, weil die Angelegenheit inzwischen bereits durch mich eine Berichtigung erfahren hatte. Im übrigen sollte Herr Falkenström wissen, dass dimorphe Weibchen bei den Gyriniden keine Seltenheit sind, zahlreiche Arten

der Gattungen *Gyretes* und *Orectogyrus* haben zwei und mehr Weibchenformen.

[*Orectochilus corniger* Zaitz.]

Orectochilus corniger Zaitz., 1910, Rev. Russe Ent. x. p. 224.

Orectochilus corniger Zimm., 1917, Ent. Mitt. vi. p. 168.

Orectochilus corniger Peschet, 1923, Opusc. Inst. So. Saigon, i. pp. 11 u. 12.

Orectochilus corniger Ochs, 1927, Suppl. Ent. xv. pp. 117 u. 122.

Orectochilus corniger Ochs, 1928, Ent. Bl. xxiv. p. 101.

Orectochilus corniger Ochs, 1930, Ann. Mus. Zool. Acad. St. Petersburg. xxxi. p. 69.

Orectochilus corniger Ochs, 1931, Arch. Hydrobiol., Suppl. 8, Trop. Binnengewässer, i. p. 474.

Das Zoologische Museum Berlin besitzt 1 Exemplar aus der Ausbeute Waterstradt's von Nord-Borneo, Kinabalu.

(?) *Orectochilus pusillus* Rég.

Orectochilus pusillus Rég., 1882, Ann. Mus. Stor. Nat. Genova, xviii. p. 74.

Orectochilus pusillus Rég., 1883, Ann. Soc. Ent. Fr. (6) iii. p. 430.

(?) *Orectochilus pusillus* Ochs, 1928, Ent. Bl. xxiv. p. 102.

Mt. Dulit, river Koyan, 2500 ft., 17. xi. 1932, primary forest (*Hobby & Moore*).

In der Ausbeute der Oxford University Expedition befindet sich ein einzelnes Weibchen, welches vielleicht zu *O. pusillus* Rég. gehört, vom dem bisher nur das Männchen bekannt war. Es entspricht der Urbeschreibung in Grösse, Form und Färbung der Oberseite, die Unterseite ist aber dunkler und die tomentierte Seitenbinde der Flügeldecken hinten stärker verbreitert als für das Männchen angegeben. Bei dem mir vorliegenden Tier ist der Clypeus in der Mitte ausgerandet, er und der Kopf bis auf den Scheitel ziemlich grob quermaschig retikuliert, Halsschild feiner retikuliert. Flügeldecken quermaschig schräg sehr fein retikuliert, hinten deutlicher, stark irisierend, ausserdem mit undeutlichen Querstriecheln. Tomentbinde auf dem Halsschild vorn bis ans halbe Auge reichend, hinten parallel, auf den Flügeldecken vorn ebenso breit, hinter der Basis sofort verschmälert, dann allmählich in wenig konkaver Linie verbreitert. Vorder-tibien mit wenig verrundetem apikalem Aussenwinkel.

Orectochilus seminitens, sp. n.

Long. 5 mm. Ovatus, parum elongatus, antice attenuatus, convexus. Supra niger, leviter anescens, ad latera punctatomentosus, luteo-marginatus. Infra piceus, pectore medio,

abdomine pedibusque rufescentibus, epipleuris flavis. Labro ferrugineo, fere semicirculari, supra rotundatim reticulato et remote punctato, postice ad latera punctato-piloso, antice flavo-ciliato. Capite fortiter reticulato, areolis elongatis, transversis, reticulatione in pronoto et elytris minus impressa, valde transversa et obliqua; in elytris postice ad latera plaga magna longitudinali fortiter reticulata, areolis rotundatis bene impressis. Margine tomentoso in pronoto parum lato, post oculos valde, postice minime dilatato, in elytris antice minus lato, ad basin breviter intus dilatato, postea leviter undulatim regulariter dilatato et suturam angustissime secundum truncaturum attingente. In spatio glabro striis plurimis vix visibiliter præsentibus. Truncatura fortiter convexa, angulo interno obtuso deleta, extus sinuata, angulo externo acuto prominulo. Tibiis anticis in ♂ parum dilatatis, antice fere recte truncatis, angulo apicali externo rotundato, tarsis elongato-ovatis, antice parum attenuatis; in ♀ tibiis angustioribus, tarsis subparallelis.

Habitat.—Borneo, Sarawak, Mt. Dulit, river Koyan, 2500 ft., 17. xi. 1932, primary forest (*Hobby & Moore*).

Typus ♂ und Allotypus ♀ im British Museum; Paratype ♀ in meiner Sammlung.

Gehört in die Gruppe VI meiner Arbeit von 1928 (Ent. Bl. xxiv. pp. 78 u. 101) und schliesst sich eng an an *O. pusillus* und *O. caliginosus* Rég., nächster Verwandter vermutlich *O. mjöbergianus* Falk. (1934, Zool. Anz. cvii. p. 210). Grösser als die an erster Stelle genannten beiden Arten, in Gestalt dem *O. pusillus* (vorausgesetzt, dass das am gleichen Fundort erbeutete Stück zu dieser Art gehört) gleich, aber ohne weiteres verschieden durch die grob rundmaschig retikulierten Längsflecken auf den Flügeldecken in beiden Geschlechtern. *O. caliginosus* ist nach der Beschreibung von Régimbart von länglicherer Gestalt, und das bisher allein bekannte ♀ hat die ganze Oberseite grob rundzellig retikuliert.

Nach der Beschreibung in Gestalt und Grösse dem *O. mjöbergianus* Falk. anscheinend sehr ähnlich, Färbung der Oberseite dunkler, schwarz mit Erzschein, Analtergit ganz schwarz. Auf den Flügeldecken befindet sich bei der neuen Art in beiden Geschlechtern eine grosse matte Stelle, verursacht durch eine grobe rundzellige Retikulierung, und zwar in Form eines Längswischs, welcher die Tomentbinde innen etwas breiter als diese etwa vom ersten Drittel bis an die Trunkatur begleitet. Die

Ausdehnung des matten Flecks ist etwas variabel, auf dem glatten Raum der Flügeldecken sind einige Längsstreifen angedeutet. Die Tomentbinde scheint auf den Flügeldecken hinten weniger kräftig abgesetzt als bei *O. mjobergianus*, die S-förmige Schweifung ist nur leicht angedeutet und zwar im letzten Drittel. Die Trunkatur ist stark convex, vor dem Aussenwinkel ausgeschweift, dieser kurz spitz vorgezogen.

Der Oedeagus des ♂ ist bei der neuen Art ebenfalls sehr kompliziert und vermutlich ähnlich wie bei *O. mjobergianus* gebaut, jedoch erscheint mir der von Falkenström als Penisanhang gedeutete Teil fest mit dem Oedeagus verbunden und lediglich als dessen, allerdings stark spezialisierte Endigung. Von oben gesehen besteht der Oedeagus aus einem ziemlich parallelseitigen Schaft, der im letzten Drittel eine länglichovale Vertiefung hat. Diese wird an den Längsseiten begrenzt durch je einen, einer regulären Paramere nicht unähnlichen, apikal zugespitzten Längswulst, den apikalen Abschluss bildet eine erhöhte, kantiger, beiderseits leicht überstehender Querwulst, darunter ragt der kugelig zugespitzte Apex noch ein wenig hervor. Von der entgegengesetzten Seite sieht der Oedeagus etwa so aus wie die Abbildung 1 bei Falkenström, jedoch ist der vorderste Teil etwas mehr zugespitzt und ist eingebettet in eine Mulde, auf deren Rückseite die vorher erwähnten Wülste liegen und seitlich vorragen, welche Bildung vielleicht als Anhang gedeutet werden könnte. Von der Seite gesehen bietet sich folgendes Bild. Der basale Schaft verjüngt sich leicht bis zu der Stelle, an der die zuerst erwähnte Vertiefung auf der Oberseite beginnt. Die letztere begrenzenden Längswülste sind an ihrer Basis nach unten abgebogen und verfolgen alsdann die bisherige allgemeine Richtung, ihr scharfes Ende erscheint von der Seite als senkrechte Kante. Auf der Unterseite befindet sich an der korrespondierenden Stelle eine Anschwellung. Davor ragt nach oben der Querwulst, von andeutungsweise ambosartigem Querschnitt, von der Vorderkante der Längswülste durch eine halbrunden Ausschnitt getrennt. Unter dem Querwulst entspringt die nach vorn und oben gerichtete rundliche Spitze. Der Penis ist nur etwa $\frac{2}{3}$ so lang wie die Parameren, letztere sind im Querschnitt stark gebogen, das umgebogene Stück in etwa $\frac{2}{3}$ Länge endigend, an dieser Stelle eine Querreihe von Borstenhaaren.

Orectochilus laticinctus Rég.*Orectochilus laticinctus* Rég., 1907, Ann. Soc. Ent. Fr. lxxvi. p. 220.*Orectochilus laticinctus* Ochs, 1928, Ent. Bl. xxiv. p. 102.Mt. Dulit, river Koyan, 2500 ft., 17. xi. 1932, primary forest (*Hobby & Moore*).

Ein einzelnes Weibchen, welches sich mit Paratypen in meiner Sammlung in allen Charakteren deckt.

EXPLANATION OF PLATE XVIII.

Œdeagus von *Orectochilus seminitens*, sp. n.
Seitenansicht, etwas verdreht.LXII.—On the Coral Genus *Fungites*. By W. D. LANG,
Sc.D., F.R.S., and STANLEY SMITH, D.Sc., F.G.S.*Fungites*; Gl[editsch], 1765, 'Berlinisches Magazin,'
vol. i. p. 266.Genosyntypes.—*Fungites tubularis*; Gl[editsch], 1765,
p. 266; [Silurian Drift]; Potsdam, Brandenburg, Ger-
many. Gleditsch refers to a figure of *Fungites tubularis*
of Bekmann, a pre-Linnæan author, 1751, p. 929, pl. xix.
fig. 6. This is a species of *Heliolites*.*Fungites catenulatus*; Gl[editsch], 1765, p. 268; pl. i.
figs. 3, 4; [Silurian Drift]; Arendsee, Ruppín, and Freien-
wald in Brandenburg, Germany. The figures represent
two forms of *Halysites*.Genolectotype. Here chosen. *Fungites tubularis*.*Remarks*.—(1) The article quoted above is signed "Gl."
That this signature actually stands for Gleditsch is
rendered almost certain by the information given on
p. 478 of the same volume of the 'Berlinisches Magazin,'
namely, that Gleditsch possessed a collection of stones
from Brandenburg.It is worth noting that a postscript, signed "M"
[H. F. W. Martini, the editor of the 'Berlinisches Magazin']
follows Gleditsch's paper, and refers to additional figures
of "Kettensteine" (*Halysites*) on pl. ii. opp. p. 384,
figs. 5, 6, 7. This mis-led Sherborn (1892, p. 1120;
1926, p. 2570) and S. Smith (1930, p. 320) into mis-quoting
Martini for Gleditsch as author of the paper.(2) In choosing *Fungites tubularis*, which is an unequi-
vocal *Heliolites*, as genolectotype of *Fungites*, we make
Heliolites (Dana, 1848, p. 541) a synonym of the prior*Ann. & Mag. N. Hist.* Ser. 10. Vol. xix. 40

Fungites. This is clearly undesirable. If we had taken *Fungites catenulatus* as genolectotype, *Fungites* would have similarly supplanted *Halysites* (*Alyssites* Fischer von Waldheim, 1813, p. 387; *Halysites*, Fischer de Waldheim, 1828, p. 15). Both *Helolites* and *Halysites* are well-known, common, and well-defined genera, about whose identity there has been no shadow of controversy for about a hundred years. The names have been used in almost every paper dealing with Silurian fossiliferous rocks during that period, and at this time to supplant either name by *Fungites* would be to bring the rule of priority into contempt. We therefore most strongly advocate that *Fungites* be suppressed.

(3) It might be argued that *Fungites*, which was often used by pre-Linnæan writers for corals but was first used by Gleditsch among post-Linnæan writers, supplants *Fungia* (Lamarck, 1801, p. 369; genolectotype *F. agariciformis*; see Leuckart, 1841, p. 42), on the grounds that the termination *-ites* merely indicated a fossil, as opposed to a Recent, form. Thus *Acroporites* (Krüger, 1823, p. 265), *Madreporites* (Blumenbach, 1803, p. 154), and *Milleporites* (Martin, 1809, expl. of pl. xliii. figs. 1, 2) were used merely to indicate the fossil species of *Acropora* (Oken, 1815, p. 66), *Madrepora* (Linnæus, 1758, p. 793), and *Millepora* (Linnæus, 1758, p. 790) respectively, and were dropped as being synonyms of the earlier genera. *Fungia* then becomes a synonym of *Fungites*, and what is now known as *Fungia* requires a new name. If this argument is considered valid it affords an additional reason for suppressing *Fungites*.

LITERATURE.

- BEKMANN, B. L., in J. C. & B. L. BEKMANN. 1751. 'Historische Beschreibung der Chur und Mark Brandenburg...' Th. i. Berlin.
- BLUMENBACH, J. F. 1803. 'Specimen Archaeologiae Telluris Terrarumque inprimis Hannoveranarum. Goettingæ.' Preprint Comm. Soc. Reg. Sci. Gottingensis, vol. xv. (1804) pp. 132-156, pls. i.-iii.
- DANA, J. D. 1848-9. 'United States Exploring Expedition... Zoophytes.' 1848. Atlas of 61 plates, 1849. [Pp. 1-120 & 709-20 previously appeared in Feb. 1846.]
- [GLEDITSCH, J. G.] 1765. "Nachricht von einigen Churmarkischen Versteinerungen." Berlinisches Magazin, Band i. Stück iii. pp. 261-270, pls. i. & ii.
- FISCHER VON WALDHEIM, G. 1813. 'Zoognosis tabulis synopticis illustrata...' Editio tertia, vol. i. Mosquæ.
- . 1828. "Notice sur les polypiers tubipores fossiles." Prog. Invit. Soc. Imp. Nat. Moscou. Moscow.
- KRÜGER, J. F. 1823. 'Geschichte der Urwelt,' Th. ii. Quedlinburg & Leipzig.

- LAMARCK, J. B. 1801. 'Système des Animaux sans Vertèbres.' Paris.
- LEUCKART, F. S. 1841. 'Observationes Zoologicas de Zoophytis coralliis, speciatim de Genere Fungia . . .' Friburgi Brisigavorum.
- LINNÆUS, C. 1758. 'Systema Naturæ. . . ' Ed. x. Holmiæ.
- MARTIN, W. 1809. 'Petrificata Derbiensis; or Figures and Descriptions of Petrifications collected in Derbyshire.' Wigan.
- OKEN, L. 1815. 'Lehrbuch der Naturgeschichte.' Th. iii. Zoologie, Abtl. i. Leipzig & Jena.
- SHERBORN, C. D. 1892. 'Index Animalium . . . 1758-1800.' Sect. i. Cantabrigiæ.
- . 1926. 'Index Animalium . . . 1801-1850.' Sect. ii. pt xi. pp. 2569-2880. London.
- SMITH, S. 1930. "Some Valentian Corals from Shropshire and Montgomeryshire, with a Note on a new Stromatoporoid." Quart. Journ. Geol. Soc. vol. lxxxvi. pp. 291-330, pls. xxvi.-xxix.

LXIII.—Some new Forms of Formicidæ and a Correction.

By HORACE DONISTHORPE, F.Z.S., F.R.E.S., etc.,
Department of Entomology, British Museum (Natural History).

Family Formicidæ.

Subfamily FORMICINÆ.

Tribe MELOPHORINI.

Pseudonotoncus turneri, sp. n.

♀. Head, thorax, and petiole dark red; gaster, legs, and antennæ yellow; tibiæ and first two or three joints of tarsi darker; eyes black; covered with fine erect yellowish hairs which are longer on the thorax.

Head opaque, finely and closely punctured, together with mandibles longer than broad, narrowed in front, temples and cheeks rounded; *mandibles* armed with six sharp teeth, the first, second, and fourth being the longest; *clypeus* large with a broad raised carina ending in a somewhat turned up pointed tooth at apex; *frontal carinæ* not very long, sharply margined; *frontal area* triangular, not very clearly defined; *frontal furrow* fine, narrow, reaching median ocellus; *eyes* large, prominent; *ocelli* small, but distinct; *antennæ* long, scape projecting beyond posterior angles of head by one-fourth of its length; *funiculus* with joints 2-11 gradually increasing in length and breadth, 11 not quite as long as 9 and 10 taken together. *Thorax* strongly rugosely punctured, longitudinally at sides, granulate on pro- and mesonotum, transverse on epinotum; *pronotum* transverse convex, rounded at sides; *pro-mesonotal suture* semicircular, deeply impressed; *meso-*

notum longer than broad; *meso-epinotal suture* deeply and widely constricted; *epinotum* with two medium-sized, slightly curved, and pointed spines at the sides of base of *dorsum*, the space in front of spines confined by a ridge continued from the spine, and two smaller sharp spines situated in the middle of sides of declivity, these wider apart than the longer ones; *petiole* furnished with a thick high node, longer than broad in profile, furnished on the dorsal surface with two short sharp spines posteriorly. *Gaster* slightly longer than broad, narrowed to apex, sides and base rounded and convex. *Legs* medium, slender; *tibiæ* and *femora* somewhat spindle-shaped.

Long. 3.6 mm.

Described from a worker taken by Mr. R. E. Turner at Tambourine Mountain, S.E. Queensland, 19-26. iv. 35.

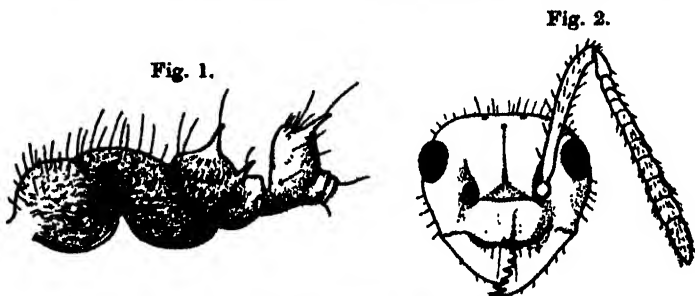


Fig. 1.

Fig. 2.

Pseudonotoncus turneri, sp. n., ♂.

Fig. 1.—Body in profile.

Fig. 2.—Head.

Type in Brit. Mus. Coll.

The genus *Pseudonotoncus* was created by Mr. J. Clark for the ants of a colony found under a log at Gellibrand at the foot of the Otway Ranges, Victoria, S. Australia [Mem. Nat. Mus. Vict. viii. p. 64 (1934)].

Tribe DIMORPHOMYRMICINI.

Cladomyrma hobbyi, sp. n.

♀. Brown; antennæ, palpi, tibiæ, and tarsi brownish yellow; clypeus, base of mandibles and mouth-parts reddish; eyes and teeth black. Whole body shining and with longer and shorter suberect yellowish hairs, and yellow decumbent pubescence in parts, especially on the ventral surface of the gaster.

Head longer than broad, rectangular, slightly narrower

anteriorly than posteriorly, covered with very fine shallow punctures and some scattered, slightly larger ones; *posterior border* slightly emarginate in centre; *posterior angles* rounded, in profile the head is somewhat narrow, slightly convex on the underside of the *chin*; the *foramen* is not situated at the posterior part of the head, there being a distinctly noticeable distance between it and the posterior border, giving the head the appearance of a cap, or button, fixed on the neck; *mandibles* robust, longitudinally striate, furnished with four strong *teeth* on the *terminal border*, the posterior one being the broadest and strongest, and the apical one the longest and sharpest;

Fig. 3.

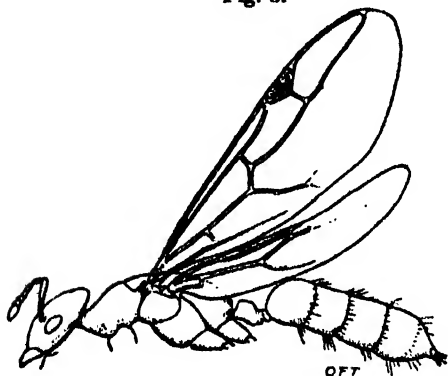
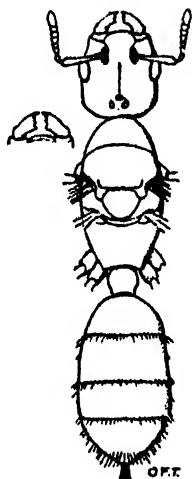


Fig. 4.



Cladomyrma hobbyi, sp. n., ♀.

Fig. 3.—In profile.

Fig. 4.—Dorsal surface.

the *external border* is furnished with a distinct tooth, or projection, before base; *clypeus* large, slightly convex, gently sloping to *anterior border*, which is slightly projecting, rounded, but slightly emarginate in centre, longitudinally striate, as are the *cheeks*; *frontal area* indistinct; *frontal carinae* short; slightly divergent posteriorly, the distance between them in the middle, and between either of them and the inner margins of the eye, being the same; *frontal furrow* reaching median ocellus, more distinct anteriorly; *eyes* large, reniform, situated at *sides* of head, slightly nearer anterior than posterior

border; *ocelli* moderate; *antennæ* short, 8-jointed; *scapes*, when bent back, barely reaching median *ocellus*; *funiculus*, first joint twice as long as broad, longer than second, 2-7 gradually increasing in breadth, 4-6 transverse, terminal joint equal in length to the two preceding taken together. *Thorax* elongate, not quite as broad as head at its broadest point (the mesonotum), narrowed and depressed anteriorly and posteriorly, rather flat on disc; *neck* rather thick, projecting anteriorly; *pronotum* and *mesonotum* covered with very fine, small punctures; *scutellum* and *epinotum* broader than long, punctured much as in the head; *metanotum* narrow, widely and deeply separated from *scutellum*, narrowly and deeply from *epinotum*; *epinotum* feebly convex and rounded to base without a distinct declivity. *Petiole* furnished with a *node*, flat on disc, finely punctured, convex beneath, anterior border truncate, narrowed anteriorly and more distinctly posteriorly, longer than high and slightly broader than long, not as high as the *epinotum*. *Gaster* long, narrow, about as long as thorax, broadest before apex, where it is broader than thorax, very finely, microscopically punctured, and transversely striate; *anal cilia* well developed. *Legs* robust, *claws* and *empodia* well developed. *Wings*: long. 6 mm., slightly tinted and iridescent; *veins* and *pterostigma* light brown, with one long *cubital cell* and one long *radial cell*, closed; the *cubitus* ends abruptly at the junction with the *radius*.

Long. 7 mm.

Described from three winged females taken in Borneo (Sarawak) by B. M. Hobby, Oxford University Expedition, two at the foot of Mt. Dulit, at the junction of the Rivers Tinjar and Lejok, in light traps, 3. viii. 32 and 1. ix. 32, and one on Mt. Dulit, 4500 ft., in moss forest, 14. x. 32.

This insect comes in the tribe Dimorphomyrmicini and is possibly a *Cladomyrma*. It may possibly be generically distinct, on account of the structure of the head, venation of the wings, etc., but, as the ♀♀ (and ♂♂) are unknown at present, it is perhaps safer to leave it in the genus *Cladomyrma* Wheeler. There are two species known, *C. andrei* Emery and *C. kewitti* Wheeler, both from Borneo. It differs from both by its larger size, venation of the wings, etc.; from *kewitti* in colour, many points in structure, puncturation, etc.

Tribe CAMPONOTINI.

Dendromyrmex wheeleri, sp. n.

♀. Dark reddish brown; palpi, apex of funiculi and tarsi, bristles on tibiæ and spurs lighter; eyes black; whole body somewhat shining, though sculptured, practically glabrous.

Head finely and closely granulate, with fine transverse striæ at temples, occiput, and between the frontal carinæ; dorsal view, longer than broad without mandibles, slightly contracted from in front of eyes to base of mandibles, strongly contracted from behind eyes to neck, and then widened to posterior angles in profile: triangular, highest at frontal carinæ above the insertion of the antennæ, from thence gradually and then more suddenly sloping to base, convex and rounded in front of frontal carinæ to base of mandibles; *mandibles* large with five or six strong sharp teeth, with a number of scattered punctures, smooth between the punctures; *clypeus* large, convex, about as long as broad with a distinct carina in the centre which forms a point; *frontal area* triangular, not very clearly defined; *frontal carinæ* high with sharp-curved edges; *frontal furrow* fine, reaching between the carinæ to nearly opposite their base; *antennæ* long and slender, *scapes* reaching beyond the pro-mesonotal suture; *eyes* large and very prominent, situated in the centre of the sides of the head. *Thorax* finely transversely striate on dorsum, longitudinally at sides, somewhat flat on dorsum; *pronotum* longer than broad, rounded at sides, which are margined, and narrowed slightly in front; *pro-mesonotal suture* semicircular, well defined; *mesonotum* as long as broad on dorsum; *meso-epinotal suture* ill defined; *epinotum* with dorsal surface continuous with the declivity, gradually rounded to base. *Petiole* with a rather thick node, triangular in profile, dorsal surface longer than anterior surface, with a straight ridge at summit. *Gaster* very short, convex on disc, narrowed at sides, and above and below, to apex, finely transversely striate. *Legs* long, slender; *coxæ*, *femora*, and *tibiæ* transversely striate, the two last somewhat compressed.

Long. 9.3 mm.

Described from nine workers taken by Captain A. R. Totton in the Quare River Valley, Trinidad, in January

1931. Named in honour of my esteemed colleague Professor W. M. Wheeler.

Type in Coll. Brit. Mus.

This species comes nearest to *D. chartifex* Smith, from which it differs in being glabrous (*chartifex* being covered with fine long hairs), darker in colour, somewhat larger, and having the eyes situated in the centre of the sides of the head. In *chartifex* the eyes are nearer to the base and placed a little higher on the head, the head being more contracted to base, etc.

Polyrhachis (Florencea, subgen. nov.) kirkæ, sp. n.

♂. Head varying from chestnut-red to almost black; thorax and petiole of a rich chestnut-red, varying to dark brown; the apex of the spines, the lateral border of the pronotum, and the pro-mesonotal suture darker; gaster honey-yellow; legs chestnut-red; femora lighter; tarsi darker; in some specimens the trochanters and femora are yellow; antennæ with scape brown; funiculus yellowish. Whole body smooth and shining, covered with very sparse short whitish hairs.

Head longer than broad, in dorsal view somewhat parallel-sided, but narrowed and rounded at base; posterior border finely margined; *mandibles* with five teeth, the end one long and pointed, smooth except for a few scattered punctures near masticatory border; *clypeus* with anterior border emarginate and slightly crenulate, the carina in centre consists of a raised ridge forming a blunt point in profile; *frontal carinæ* sharp and considerably raised, slightly convergent, and then divergent posteriorly, extending to opposite base of eyes, a raised carina is situated between them reaching nearly to their base; *antennæ* long and slender; *eyes* fairly large, slightly more than one-seventh of the total length of the head, longer than broad, prominent, situated behind middle of head. *Thorax* long and slender, round and not margined, somewhat constricted in middle; *pronotum* narrowed in front, rounded at sides, broadest before base, with a narrow margin to lateral borders, furnished on shoulders with a pair of short spines curving outwards and downwards; *pro-mesonotal suture* very distinct; no *suture* between *mesonotum* and *epinotum*; *epinotum* armed with a pair of long sharp spines which are almost parallel, the declivity somewhat abrupt. *Petiole* without any spines of any kind, flat above with rounded sides

broadest and angled before middle, narrowed before base, base narrowly margined, anterior face straight, underside slightly emarginate; *gaster* oval. *Legs* long and slender.

Long. 11·6 mm.

Subgenotype: *Florencea kirkæ*, sp. n.

Described from five workers taken by Miss L. E. Cheesman in long grass at a height of 1200 ft., at Kokoda, Papua, in April 1933.

Type in Coll. Brit. Mus.

Fig. 5.

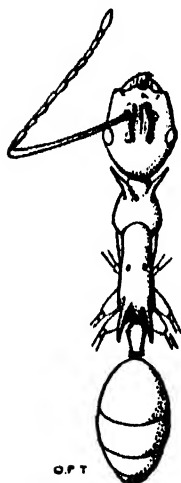


Fig. 6.



Polyrhachis (Florencea) kirkæ, sp. n., ♀.

Fig. 5.—Dorsal surface.

Fig. 6.—In profile.

The subgeneric and trivial names in honour of the late Florence J. Kirk.

This new subgenus comes near to W. M. Mann's *Dolichorhachus* in some respects, but the absence of any margins to the thorax and especially the want of spines to the petiole renders it abundantly distinct. The latter character and the epinotal structure also separate it from the subgenus *Myrmhopla*.

This insect bears a strong superficial resemblance to the Myrmicine ant *Aphænogaster (Planimyrmæ) lorai* Emery (also taken by Miss Cheesman in Papua), especially in the darker-coloured specimens, and in the spines on the pronotum and epinotum, etc. The colouring is

most unusual for a *Polyrhachis*, and personally I regard this as a case of mimicry.

Polyrhachis (Myrmothrinax) textor Smith
var. *brunneogaster*, var. nov.

♂. Black; mandibles, apex of scapes, gaster, and legs dark reddish brown; apex of funiculi and tarsi testaceous.

Gaster opaque, covered with very fine close microscopical punctures.

Long. 7 mm.

This variety differs from the typical form from Malacca in colour, the sculpture is stronger, the spines on the epinotum are considerably longer and sharper than those of the prothorax, which are very short and blunt. The two outer spines on the petiole are almost as long as the one in the centre.

Described from ten specimens taken by Mr. Gilbert Rogers in Central Nicobar Island in 1906.

Type in Coll. Brit. Mus.

This variety differs from the vars. *hero* Forel (Sumatra), *æqualis* Forel (Philippines, Sumatra), and *charpillioni* Forel (Sumatra, Malacca) in colour, structure, etc.

Polyrhachis (Myrma) vigilans Smith.

♂ undescribed.

Black; whole body covered with fine, short, close, golden or silvery, decumbent pubescence; body, legs, and scapes furnished with long, erect, whitish hairs.

Typical *Myrma* in structure. The *eyes* are very conical and prominent, sticking out sideways, not upwards, in which they agree exactly with Smith's type of *Polyrhachis vigilans* ♀, although he does not mention this character in his description. The *pronotal spines* are a little longer and sharper than in the ♀, and the four *spines* on the petiole are considerably longer and sharper. Those on the upper angles are long, sharp, and slightly curved inwards and backwards, and the two lateral ones are sharp and not truncate, or bimucronate.

Long. 8.5–9 mm.

Described from two workers taken by Commander J. J. Walker at Tamaon I., China, in 1892.

♂ type in Coll. Brit. Mus.

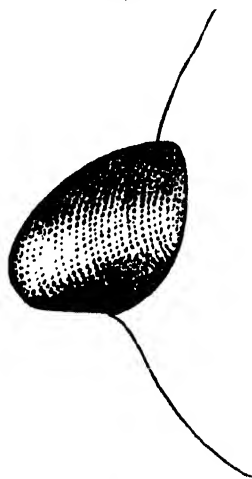
Smith described the species from a single dealated

female from Hong Kong [Cat. Hym. in Coll. Brit. Mus. vi. p. 69, 1858].

Type in Brit. Mus. Coll.

This species comes near to *P. (M.) illandata* Walker, 1859 (= *mayri* Roger, 1863), *P. (M.) intermedia* Forel, and *P. (M.) proxima* Roger; from all three of which it differs in its extraordinary shaped eyes. From the first species it also differs in possessing slightly longer teeth to the petiole, those on the upper angles being slightly more curved backwards; and from the two latter because the lateral teeth are not truncate or bimucronate.

Fig. 7.



Eye of ♂ of *Polyrhachis (Myrma) vigilans* Smith.

Polyrhachis (Polyrhachis) lamellidens Smith.

♀. Black, very shining; petiole except apex of spines, insertion of antennæ, and wings, claws, and spurs red, furnished with long erect scattered hairs, which are more numerous at base of head, pronotal spines, base of thorax, petiole and spines, and base of gaster; some fine decumbent silvery pubescence is present on pronotum, epinotum, and sides of thorax.

Head rather more elongate than in ♂, smooth and shining all over instead of being finely coriaceous; *mandibles* larger with longer sharper apical tooth; *eyes* larger; *ocelli* present. *Thorax* smooth and shining instead of being strongly coriaceously punctured, rounded at sides,

no spines to *mesonotum*; *epinotum* rounded not flat, with two rounded blunt peg-like *spines*, which are slightly thicker and round at apex; *petiole* with *spines* wider apart at base, and much less curved at apex. *Gaster* smooth and shining. *Legs* as in ♀, but more shining. *Wings* typical *Polyrhachis*, light brown, with darker *veins* and *pterostigma*.

Long. 9 mm.

Described from five dealated females taken by Commander J. J. Walker at Da-laen-Saen, China, in 1892, and one winged female taken by S. Akiyami at Idzu, Japan, June 1910.

♀ type in Brit. Mus. Coll.

The female does not appear to have been described before. The only reference to it in the 'Genera Insectorum' (Emery) is "*P. lamellidens*, Yano, Japanese *Polyrhachis* (en japonaise), pl. avec 12 fig. (date ?) ♀♀♂, larve." There is no reference, it is not in the Museum library, and as it is in Japanese it seems as well to give an English description. If it had not been that we possess a Japanese ♀ and ♀ taken together by S. Akiyami, I should have hesitated in describing the ♀ from the Chinese specimens, as the ♀ and ♀ are so very unlike each other.

P.S.—In a short paper, "On a small Collection of Ants made by Dr. F. W. Edwards in Argentina" [Ann. & Mag. Nat. Hist. (10) xii. pp. 532–538 (1933)], I described three species of *Acanthomyops*—*A. (Donisthorpea) edwardsi*, *A. (Chithonolasius) negrensis*, and *A. (C.) rufo-niger*.

My good friend Professor W. M. Wheeler suggested to me that the gizzards of these species should be dissected out, as he thought they must belong to the genus *Lasiophanes* Emery. He also kindly sent me some slides with the gizzards of this and allied genera. Having had the gizzards of my species made into slides, he was proved to be right, and all three species must be placed under the genus *Lasiophanes*. This has been done in the collection. I must admit that these species are much more like *Acanthomyops* than any *Lasiophanes* or any other *Melophorini* we possess; moreover, they work out to *Acanthomyops* by Emery's table in the 'Genera Insectorum.' Nevertheless, the shape of the gizzard is the final test.

INDEX to VOL. XIX.

- ABYSSINIAN Carabidæ**, 410.
African, South, Thysanoptera, 97.
Afronurus, new species of, 433.
Afrostelia, new species of, 504.
Agonum, new species of, 539, 542.
Alexander, C. P., on new or little-known Tipulidæ, 329.
Alluaud, Charles, on Abyssinian Coleoptera, 272.
Ammonite genus Gastroplites, 257.
Andrewes, H. E., on Oriental Carabidæ, 489.
Anseriformes, 370.
Anthidium, new species of, 151, 152.
Anthophora, new species of, 142.
Apocnemidophorus, gen. et sp. n., 207, 213, 216-222.
Ashmeadiella, new species of, 405.
Asiatic bees, 151.
Augochlora, new species of, 314.
Austridotea, gen. et sp. n., 115-123.
Austrolimnophila, new species of, 342.
Automolis, new species of, 144.
Barker, R. W., and Grimsdale, T. F., on Mexican Fossil Foraminifera, 161.
Barnard, K. H., on the identity of the Cape "White-fish," 304.
Baylis, H. A., on parasitic worms from East African chameleons, 584.
Bees, descriptions and records of, 136, 495, 544.
 —, Asiatic, 151.
 —, North American, 313, 393.
Beier, M., on Mantodea from the Lake Rudolf Rift Valley, 376.
Belorrhinus, new species of, 189-191.
Bibliographical notices: 'British Grasshoppers and their Allies, a Stimulus to their Study' (Malcolm Burr), 160; 'The Birds of Tropical West Africa,' vol. iv. (D. A. Bannerman), 160.
Borelis, new species of, 174.
Borneo, Mutillidæ from, 441.
Bruun, Anton Fr., on a new flatfish from Panama, 311.
Burgeon, L., on Carabidæ from Abyssinia, 539.
Burkenroad, M. D., on the structure etc. of Sicyonella Borradaile, 505.
Butler, A. J., on new species of Omphyma and on the Pycnactis-Phaulactis group of Silurian corals, 87.
Calandrinien, südostasiatische, 178.
Calathus, new species of, 276-279.
Calliopsis, new species of, 323.
Carabidæ, Abyssinian, 410, 539.
 —, Oriental, 489.
Ceratoneura, new species of, 532.
Cercidocerus, new species of, 185-188.
Chaworth-Musters, J. L., on the type-locality of Ellobius talpinus, 158; on the nomenclature of the Palaearctic chipmunk, 158.
China, W. E., and Helmsing, I. W., on the biology and ecology of Hemiodosous veitchei, 473.
Chipmunk, Palaearctic, 158.
Chlanis, new species of, 282.

- Ciconiiformes, 370.
 Cinygmmina, gen. et sp. n., 435.
 Cladomyrma, new species of, 620.
 Cnemidophorus, new species of, 205, 206.
 Cookerell, T. D. A., descriptions and records of bees, 136, 495, 544.
 Colefax, A., and Dakin, W. J., on a pelagic Nudibranch from New South Wales, 266.
 Coleoptera, Abyssinian, 272, 578.
 — from Sarawak, 596.
 Colletes, new species of, 136-140.
 Collin, J. E., on Diptera from East Greenland, 594.
 Conanthaliectus, new species of, 326.
 Cratopus, new species of, 248-253.
 Crocisa, new species of, 544-552.
 Crocisaspida, new species of, 504.
 Curculionidae from Mauritius, 248.
 Dakin, W. J., and Colefax, A., on a pelagic Nudibranch from New South Wales, 266.
 Dendromyrmex, new species of, 623.
 Denny Collection of Mallophaga in the British Museum, 74.
 Diadema, on the Echinoid name, 463.
 Diptera from East Greenland, 594.
 Dolichocheza, new species of, 331-334.
 Donisthorpe, H., on new forms of Formicidae, 619.
 Eodyonurus, new species of, 438, 439.
 Eirone, new species of, 148.
 Elidothynnus, new species of, 146.
 Ellobius talpinus, type-locality of, 158.
 Encopothynnus, new species of, 147.
 Ephemerina, new species of, 431.
 Ephemeroptera, new, 431.
 Ephutomorpha, new species of, 454.
 Falconiformes, 379.
 Fauriella, gen. et sp. n., 97, 98.
 Fish, a remarkable, from Lower Permian of Autun, France, 553.
 Fishes, fossil Cichlid, 381.
 Flatfish, new, from Panama, 311.
 Foraminifera, Mexican fossil, 161.
 Formicidae, new, 619.
 Freshwater Idoteidae of New Zealand, 113.
 Friant, Dr. Madeleine, sur le prétendu genre Pseudaplodon de Gerrit S. Miller (Aplodontia asiatica Schlosser) du Pontien de Mongolie, 456.
 Fungites, on the coral genus, 617.
 Grimsdale, T. F., and Barker, R. W., on Mexican Fossil Foraminifera, 161.
 Gudger, E. W., on the structure and development of the Ocean Sunfish, 1.
 Gunther, Klaus: Studien über südostasiatische Calandrinien, 178.
 Gynastes, new species of, 349-351.
 Gynoplistia, new species of, 344-347.
 Halictoides, new species of, 328, 393-401.
 Halictus, new species of, 315, 316.
 Hayman, R. W., on mammals from the Lake Rudolf Rift Valley, 530.
 Helionothrips, new species of, 108, 110.
 Helmsing, I. W., and China, W. E., on the biology and ecology of Hemiodoncus veitchei, 473.
 Hennig, Willi: Tyliad aus der Sammlung des British Museum, 521.
 Heptagenia, new species of, 437.
 Hercinothrips, new species of, 105.
 Heriades, new species of, 143, 495-502.
 Hesperapis, new species of, 327.
 Hinton, H. E., on new African Lavinia, 289.
 Holmes, P. F., on a new species of Ostracod, 422.
 Hood, Douglas, on new genera and species of Thysanoptera from South Africa, 97.
 Hustache, A., Magdalinae de l'Amérique méridionale, 198.
 Hydrethus, new species of, 302.
 Hymenoptera, fossorial, 144.
 Hypochrysa, new species of, 307.
 Idoteidae, freshwater, of New Zealand, 113.
 Iguana remains from Barbados, 306.
 Ischnotoma, new species of, 329.
 Kimmins, D. E., on a new African Hypochrysa, 307; on some new Ephemeroptera, 431.
 Kleins, R., on Abyssinian Coleoptera, 578.
 Korab Mountains, new rodents from, 514.
 Lamosaccus, new species of, 229-246.

- Lang, W. D., and Smith, S., on the coral genus *Fungites*, 617.
- Lavinae, new African, 289.
- Leptolepis bronni, 46.
- Limonia, new species of, 335-341.
- Lycus, new species of, 582, 583.
- Magdalena de l'Amérique méridionale, 198.
- Mallophaga, species of, 261, 370.
- in the British Museum, 74.
- Mammals from the Lake Rudolf Rift Valley, 524.
- Mantodea from the Lake Rudolf Rift Valley, 376.
- Maritrema, on the excretory system of the Trematode genus, 355.
- Marshall, Sir Guy A. K., on new Curculionidae from Mauritius, 248.
- Martino, V. & E., on new rodents from Korab Mountains, 514.
- Masturus lanceolatus, 1.
- Mavromoustakis, G. A., on new Asiatic bees, 151.
- Mediterranean Polychæta, 82.
- Metaprodicotes, new species of, 183, 184.
- Michener, C. D., on North American bees, 313, 393.
- Mickel, C. E., on Mutillidae from Borneo and the Solomon Islands, 441.
- Microphallinae, on the systematic position of the, 355.
- Monro, C. C. A., on Polychæta from the Eastern Mediterranean, 82; on Polychæta from South Africa, 366; on new Polychætes from the Indian Ocean, 531.
- Morison, G. D., on a new species of Plesiothrips from Argentina, 469.
- Mortensen, Th., on the Echinoid name *Diadema*, 463.
- Mutillidae from Borneo and the Solomon Islands, 441.
- Neomagdalis, gen. et sp. n., 201, 202.
- Netolitsky, Dr. Fritz, on Abyssinian Carabidae, 410.
- Nicholls, G. E., on the freshwater Idoteidae of New Zealand, 113.
- Nixon, G. E. J., on a new genus of Platygasterinae, 372; on new African species of Telenomus, 387.
- Nomia, new species of, 318.
- Notidotea, subgen. nov., 126.
- Nudibranch from New South Wales, 266.
- Ocean Sunfish, 1.
- Ochs, Georg, on Coleoptera from Sarawak, 596.
- Omphyma, new species of, 88, 89.
- Opisthothrips, gen. et sp. n., 101, 102.
- Orectochilus, new species of, 606-614.
- Oridia, new species of, 366.
- Oriental Carabidae, 489.
- Oarnia, new species of, 406-408.
- Ostracod, new species of, 422.
- Oxythoespis, new species of, 378.
- Palaearctic chipmunk, 158.
- Panurginus, new species of, 322.
- Paraanthidium, new species of, 155.
- Parheteromastus, gen. et sp. n., 536.
- Pentarthrum, new species of, 256.
- Pitymys, new species of, 514.
- Platygasterinae, on a new genus of, 372.
- Platystasius, new species of, 372-375.
- Plesiothrips, new species of, 469.
- Pleurothorax, new species of, 182.
- Pœcilotylus, new species of, 521.
- Polychæta from Eastern Mediterranean, 82.
- from South Africa, 366.
- Polychætes from the Indian Ocean, 530.
- Polyrhachis, new species of, 624.
- Potamodytes, new species of, 292-299.
- Pseudaplodon, le prétendu genre, 456.
- Pseudocandona, new species of, 422.
- Pseudolepidina, gen. et sp. n., 169, 172.
- Pseudonotonous, new species of, 619.
- Pseudopanurgus, new species of, 320.
- Pycnactis-Phaulactis group of Silurian corals, 87.
- Rayner, Dorothy H., on Leptolepis bronni, 46.
- Rhagaster, new species of, 150.
- Rothschild, Lord, on females of Automolis pulcherrima and a new species of Automolis, 144.
- Rothschild, Miriam, on the excretory system of the Trematode genus Maritrema and the systematic position of the Microphallinae, 355.
- St. Leger, Jane, on mammals from the Lake Rudolf Rift Valley, 524.

- Scolaricia*, new species of, 83.
Scytha, new species of, 255.
Sicyonella Borradaile, 505.
 Silurian corals, 87.
Smicromyrme, new species of, 451, 452.
 Smith, S., and Lang, W. D., on the coral genus *Fugites*, 617.
 Solomon Islands, *Mutillidae* from, 441.
 Spath, L. F., on the Canadian Ammonite genus *Gastrolites* in the English Gault, 257.
Sphenocorynus, new species of, 195.
Spinoliella, new species of, 324.
Stenobothrus, Moroccan species of, 308.
 Sunfish, Ocean, 1.
 Swinton, W. E., on iguana remains from Barbados, 306.
Tasiocera, new species of, 352, 353.
Telenomus, new species of, 388, 389.
 Thompson, G. B., on the Denny Collection of Mallophaga in the British Museum, 74; on Mallophaga, 261, 370, 379.
Thysanoptera from South Africa, 97.
Timulla, new species of, 441, 446.
Tipulidae, new or little-known, 329.
Trewavas, Ethelwynn, on fossil Cichlid fishes, 381.
Tritrichia, gen. et spp. nn., 489-494.
Tropidopola, new species of, 519.
 Turner, R. E., on fossorial Hymenoptera, 144.
Tylidae aus der Sammlung des British Museum, 521.
Tyndides, new species of, 194.
 Uvarov, B. P., on Moroccan species of *Stenobothrus*, 308; on Tropical species of *Tropidopola*, 518.
 Westoll, T. S., on a remarkable fish from the Lower Permian of Autun, France, 553.
 "White-fish," Cape, 304.
 Worms, parasitic, from East African chameleons, 584.
Zargochilus, new species of, 281.
Zaspilothynnus, new species of, 144.
Zethus, new species of, 193.

END OF THE NINETEENTH VOLUME.

FIG. 1.

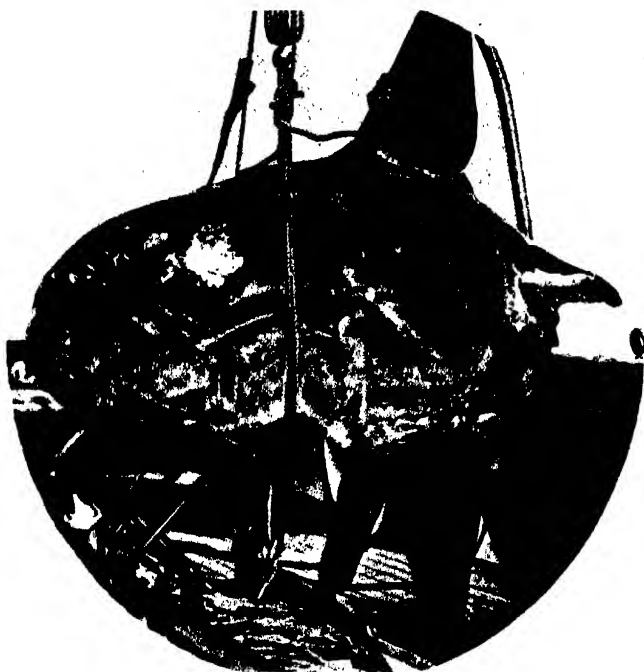


FIG. 2.



FIG. 3.



Fig. 1.—*Masturus lanceolatus* taken in North Atlantic.

Fig. 2.—2.8 mm. larval *Masturus*—the smallest on record.

Fig. 3.—Smallest (5 mm.) post-larval *Masturus* ever figured.

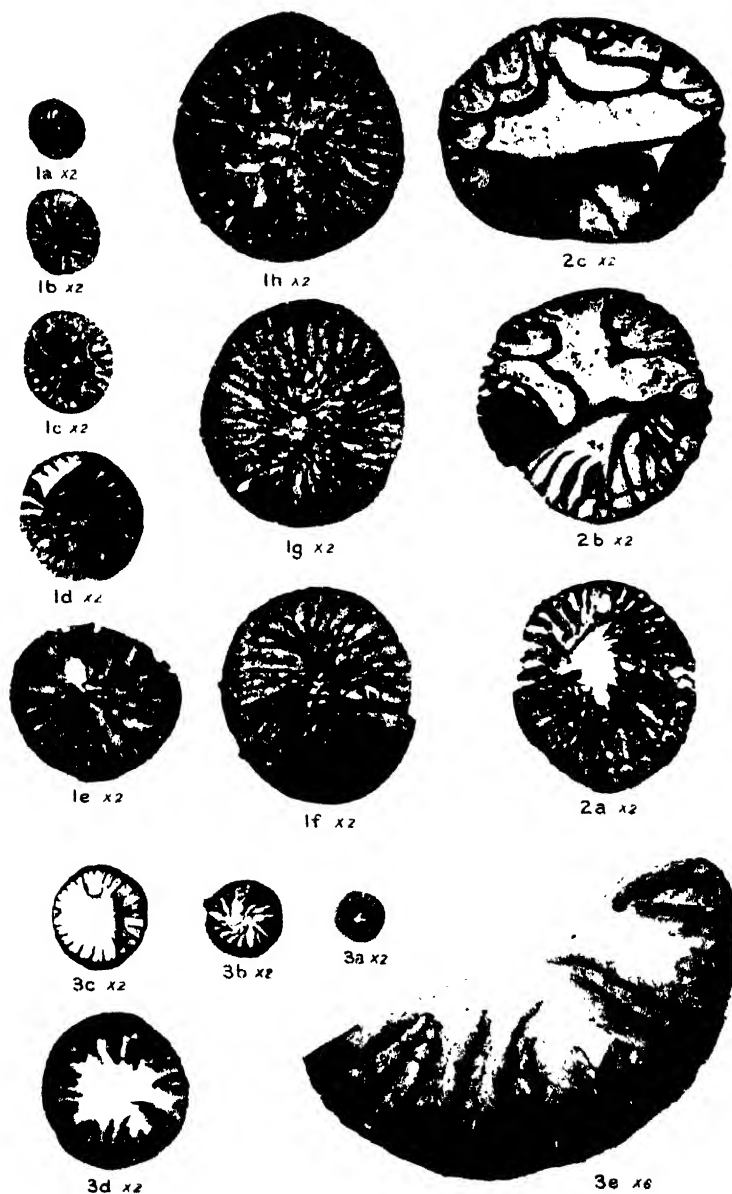
FIG. 5.



FIG. 24.



FIG. 5.—A 10.5 mm. *Masturus* from the Sargasso Sea.
FIG. 24.—Dried tail of adult *Masturus* from Daytona.
FIG. 25.—Dried tail of a *Masturus* from Miami.



A. J. B. photo.

OMPHYMA DUPLEX, sp. nov.



1 nat size



2 nat size



3 nat size



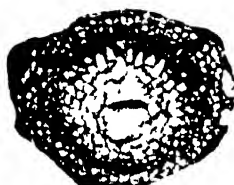
6d x2



7f nat size



4 nat size



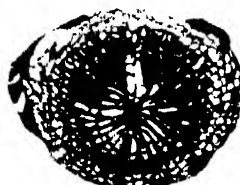
6c x2



7e nat size



7d nat size



6b x2



7c nat size



5 nat size



6a x2



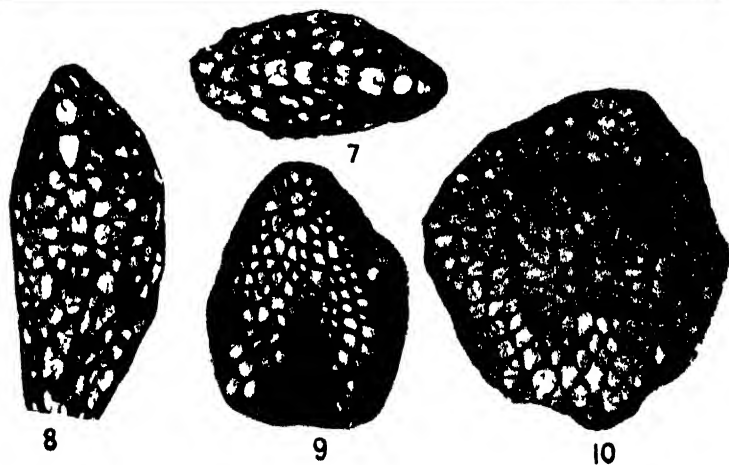
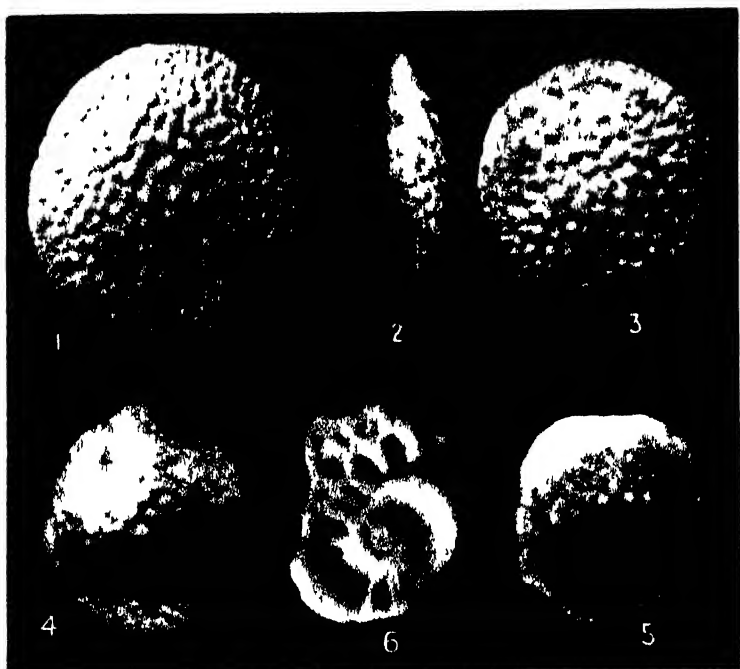
7b nat size

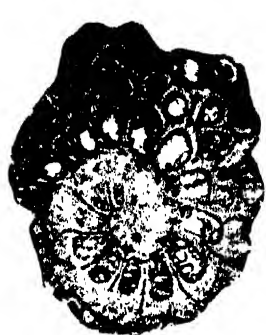


7a nat size

A J B photo.

OMPHYMA AND PHAULACTIS.





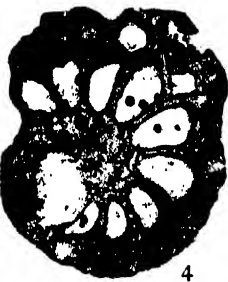
1



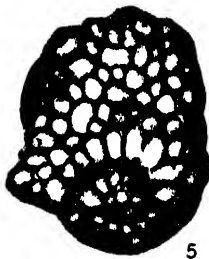
2



3



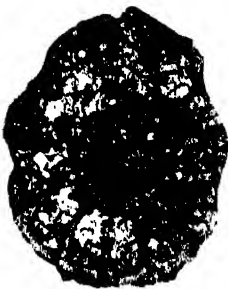
4



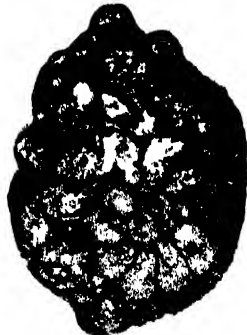
5



6



7



8



1

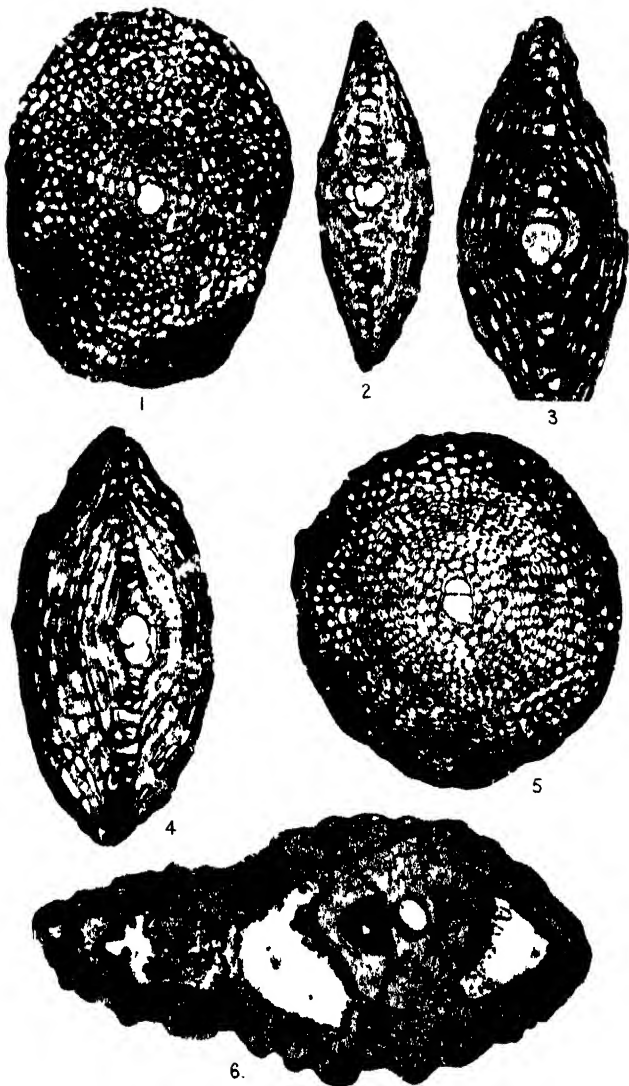


3

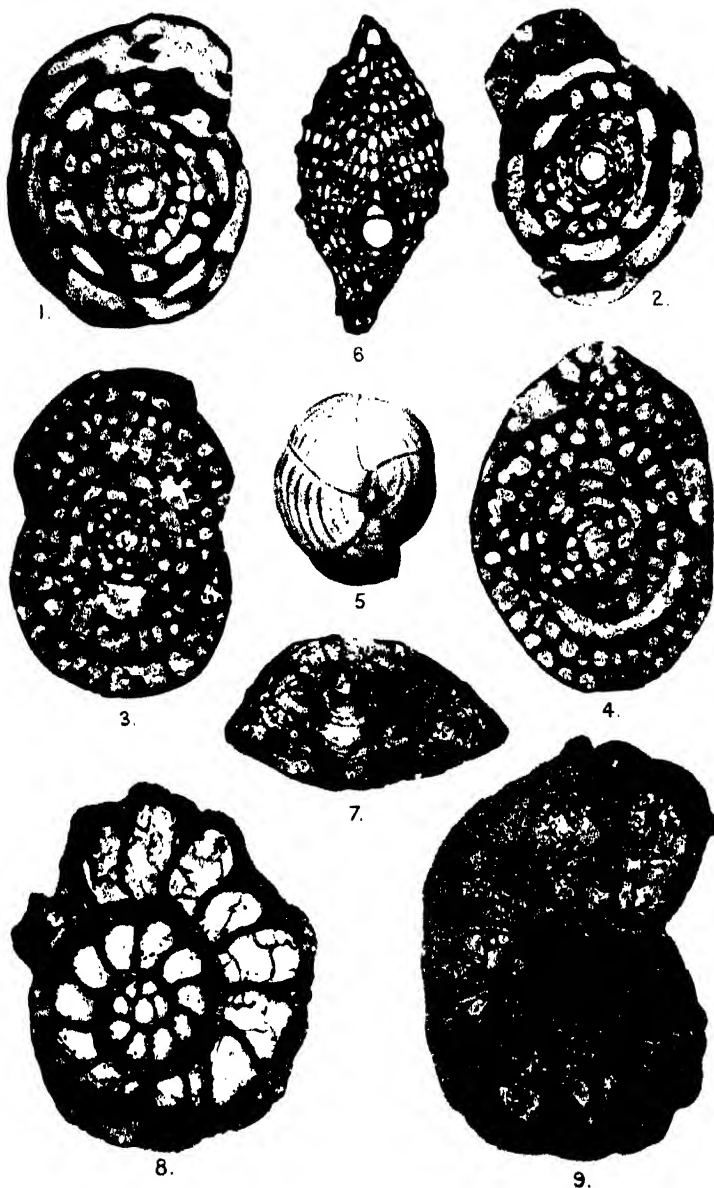


4

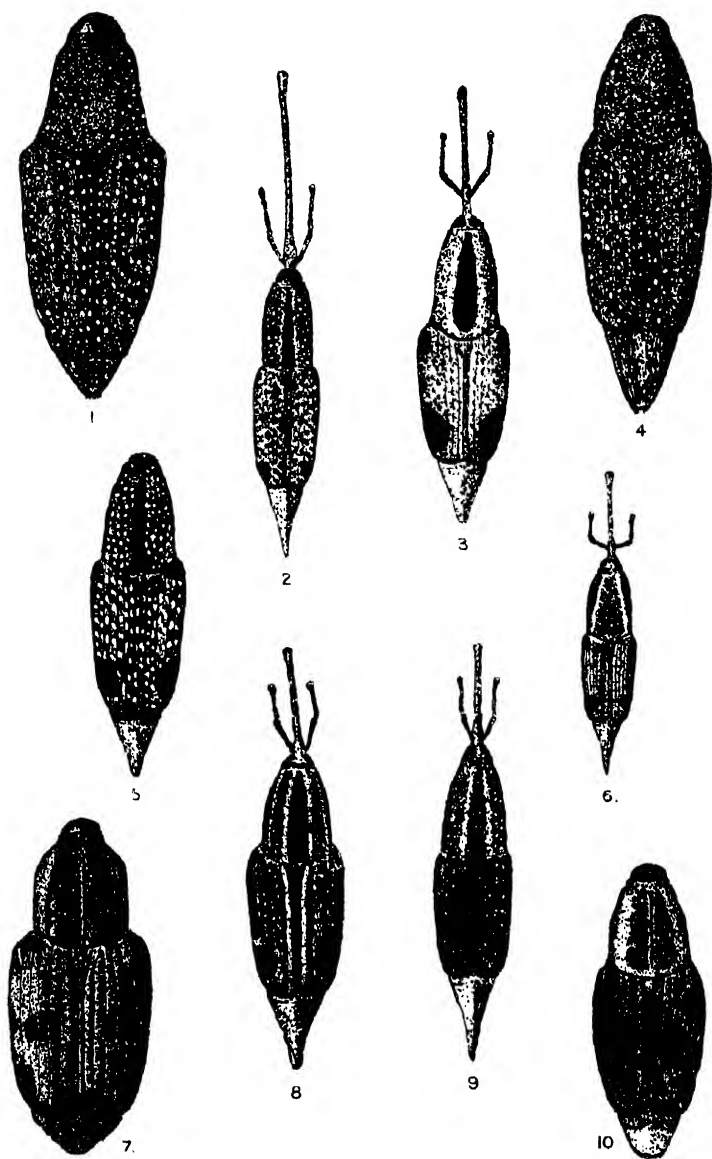
MIOGYPSINA.



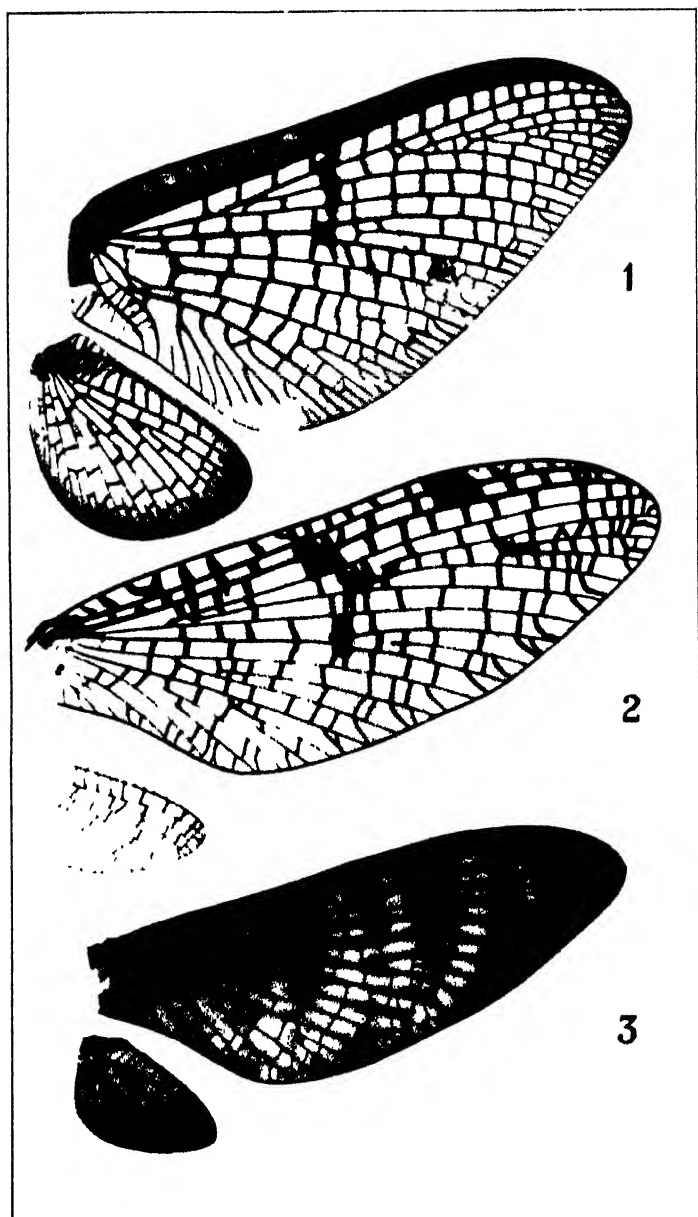
PSEUDOLEPIDINA AND MIOGYPSINA.



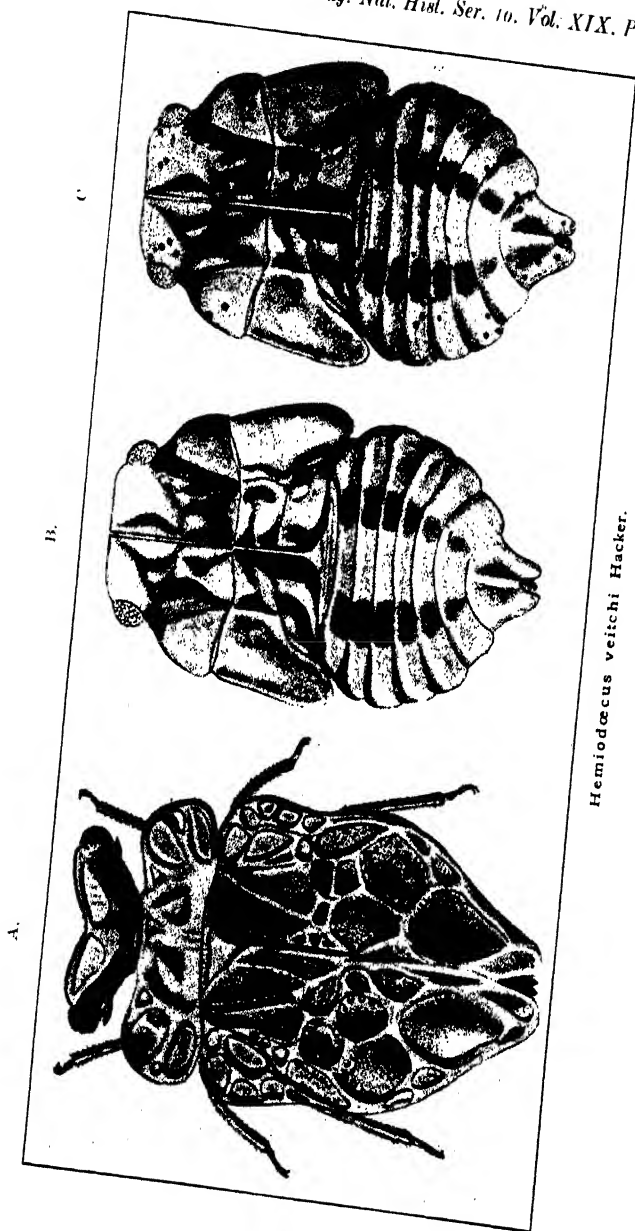
BORELIS, ROTALIA, AND MIOGYPSINA.



SÜDOSTASIATISCHE CALANDRINEN.



New Ephemeroptera.



Hemiodæcus veitchi Hacker.

A



B



C



A. View taken from Wanungara Lookout.

B. Antarctic beeches at Lightning Falls Turnoff.

C. A typical dead branch of *Nothofagus* covered with moss.

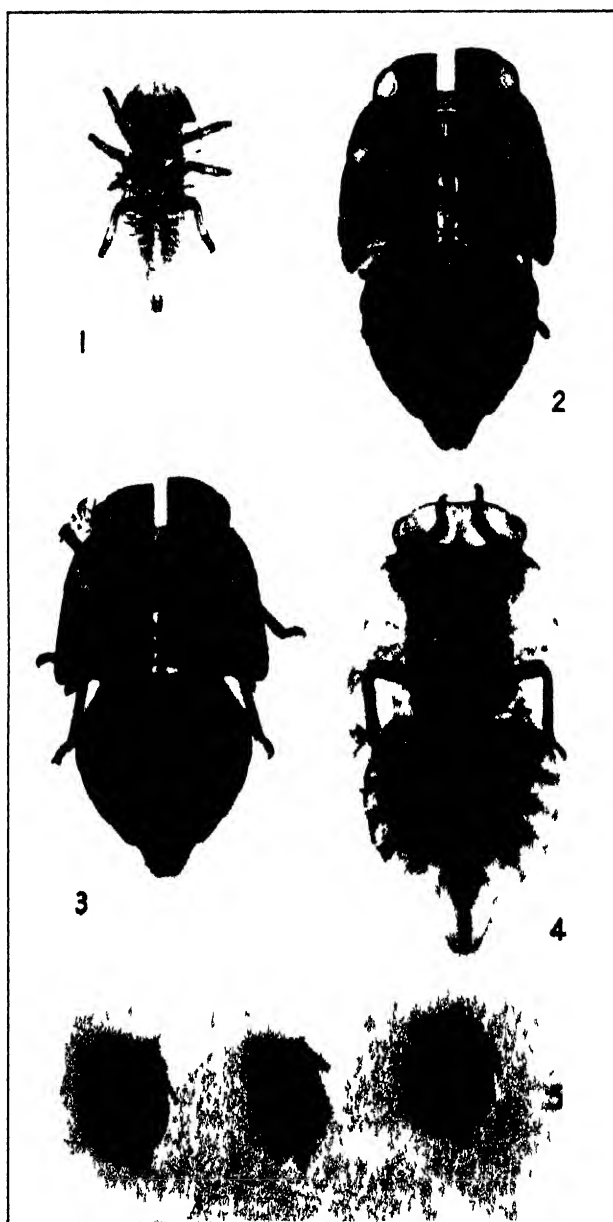
A



B



Hemiodæcus veitchi, Hacker



Hemiodæcus veitchi Hacker.

A



B.



A. Adult of *Hemiodocus veitchi* showing distribution of fungal pycnidia.
B. Fungal pycnidia, enlarged. Note mycelium on surrounding tissue.

FIG. 1.

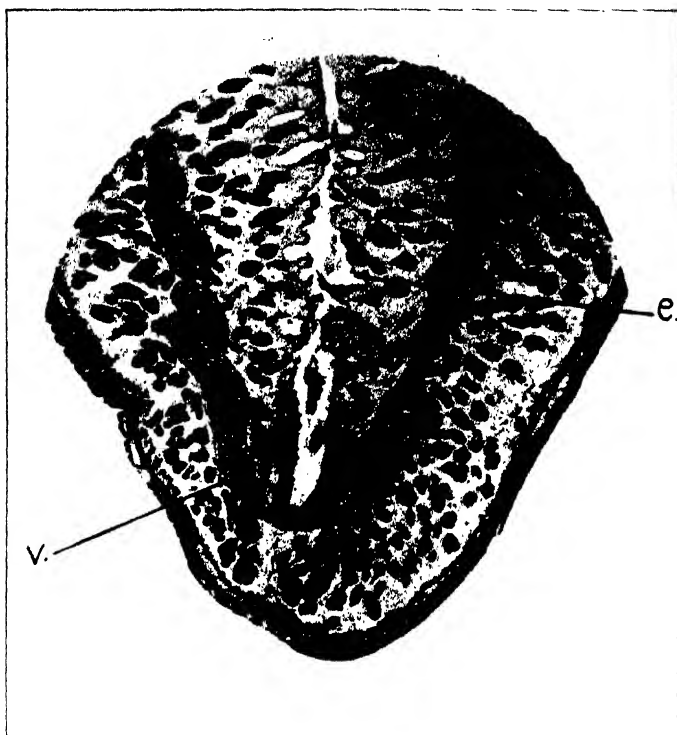


FIG. 2.

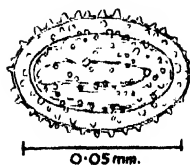
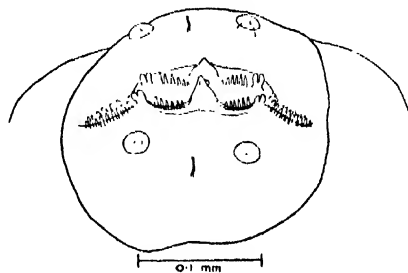
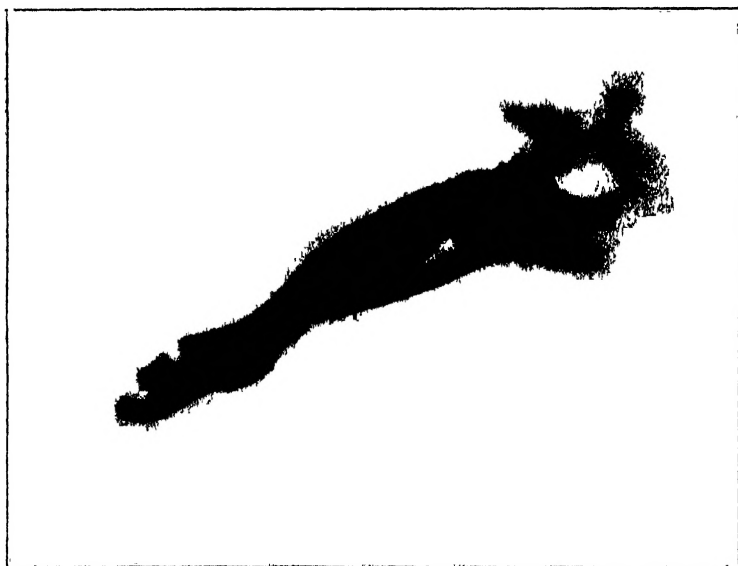


FIG. 3.



Parasitic Worms from East African Chamæleons.



Oedeagus von *Orectochilus seminitens*, sp. n.

I. A. B. I. 75

IMPERIAL AGRICULTURAL RESEARCH
INSTITUTE LIBRARY
NEW DELHI.

[illegible]